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The MODEL ENGINEER

Edited by

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SMOKE RINGS

The Norwich Exhibition.

I HAVE it, from one of my staff, that the recent Exhibition at Norwich, organised by the Norwich and District Society of Model Engineers, which was open to the public on the 3rd to 5th inclusive of this month, surpassed, in many respects, the hopes of the most sanguine of its promoters. My informant, who represented the "M.E." at the opening, and also acted as judge, will, in a future issue give fuller particulars of models and prize winners connected with it. For the moment, it may be of interest to record that the computed number who passed the pay door in the three days was of the order of 4,000, and that, while the total competition entries numbered 106, including 18 in the open class, and 26 in the scholar's class, there were also upward of 100 first-class models on loan, the greater number of which were provided by members, and shown running under air pressure. There were also five firms accorded space for a trade show, in addition to those loan models lent by trade firms, and one of these enterprising people came from London after having run a successful show at our Exhibition. The founding of a members' workshop in Norwich, now an accomplished fact, will be substantially supported by this exhibition effort, and my hearty congratulations are offered to Mr. President H. O. Clark, Mr. Chairman G. W. Barker, the acting executive, and the Society's popular Hon. Sec., Mr. W. F. A. Way.

* * *

Exhibition of Inventions.

INVENTORS and patentees have now special facilities of showing and demonstrating their inventions through the Exhibitions held yearly by The Institute of Patentees, Incorporated, of 10, Victoria Street, London, S.W. There is always much of interest displayed at these events. The recent Exhibition, eleventh of the series, held at the Central Hall, Westminster, included three items alone thoroughly worth going to see—an organ, "The Magneton," in which the tone production is entirely electrical, and without strings or pipes; a photo sculpture system for producing images, busts, and the like by combination of photography and machine, and the "Ashdown" instrument and system of optically verifying the speed of shafting. Numerous mechanical, domestic, electrical and amusement inventions afforded a very entertaining show. My readers who live in the North should note that it is to be transferred to St. George's Drill Hall, St. Mary's Place, Newcastle-on-Tyne, and will be open to view from November 20th to 30th inclusive, under the title of "The Northern Exhibition of Inventions," organised by the Institute and the "Newcastle Chronicle," Ltd. About one hundred additional inventions will, I am informed, be added to those shown in London, and various famous engineering firms of the North East district are contributing exhibits to the show.

* * *

The Passing of a Veteran.

ON Saturday, October 19th, a party organised by the Aylesbury Gang assembled at Ashridge Pumping Station, near Tring, Herts., to witness the final run of the beam engine which for upwards of 70 years faithfully fulfilled the duties of pumping the water for Ashridge village and estate, and now, being superseded by electric pumping equipment, is to be relegated to the scrap heap. The ceremony, though a quite informal one, was most impressive, and memories of a past generation of engineers were heightened by the period costume assumed by Mr. A. G. Woodwards, who acted as operator and high priest of ceremonies for the occasion. Among the visitors were Mr. James C. Crebbin, Dr. Robinson,

and Mr. H. O. Clark, of Norwich, besides quite a large number of anonymous enthusiasts, who, together with the members of the Gang, made up a party of over fifty strong. It is fitting that this tribute to the memory of one of the last remaining relics of the age when engines were works of art as well as utility, should have been made by model engineers, whose efforts to perpetuate in miniature the beauties of these old engines are, in many cases, the only permanent records available. We hope to publish further details of this ceremony in an early issue of the "M.E."

* * *

Theoretical Discussions.

THE Practical Letters columns of the "M.E." are, as their name implies, intended particularly for the purpose of enabling readers to discuss matters arising out of practical problems in model engineering, and are valued by readers as a tribunal in which valuable information often emerges from the threshing out of controversial matters. There is no definite restriction on the subjects put up for debate, but occasions arise where a matter of purely academical interest, or one that does not allow of a practical solution, may be considered unsuitable for publication. One or two cases have arisen lately where a theoretical question in the Practical Letters columns has elicited a flood of replies, none of which, however, have offered a solution capable of practical proof. It has, therefore, not been possible to publish quite a number of the replies. The question arises, do readers as a whole appreciate this type of discussion, or would they prefer the Practical Letters columns to be reserved entirely for discussions on purely practical matters? Some of the theoretical questions asked are hardy annuals, which go the rounds time and time again in technical schools and engineering works, as a topic for discussion among students and apprentices, or sometimes, it may be whispered, as a trap for the feet of physics masters or instructors.

* * *

Appreciation from Australia.

MR. W. C. MATHISON writes :—"I have often thought that I would like to write and express my appreciation of the personal touch given by your Smoke Rings. It brings out your great interest in the thoughts and work of every reader, and I fancy that the MODEL ENGINEER has the friendliest note of all publications. I am sure you know by this time from your many contributors, what part you have had in the happiness of thousands since the MODEL ENGINEER started publication. There would have been a tremendous amount of interesting work, which would never have been attempted without its advice and interest. I was trained as an engineer, and, therefore, can appreciate the high excellence of our Magazine. I took up land pursuits, and have found very great value in keeping up my interest in a hobby, which not only teaches the use of tools, but stimulates the mind as well. I bought my lathe in 1915, and as it was a time of drought and worry, I found that working at night after a worrying day, eased my worries to a very great extent, and I am sure without that lathe I should have become very despondent. I have been a subscriber since 1914, and as the years go by I find that the old joy of opening a new number never departs. I am quite sure that, mentally, I have received an incalculable benefit from the practice of model work. I wonder how many readers go back over previous volumes. I often find new interest in back numbers, perhaps looking at an article in a different light than was apparent when first reading it."

* * *

Lectures on Model Power Boats.

AT a recent Committee meeting of the M.P.B.A., it was decided that it would be very desirable to inaugurate a lecture programme for the winter session, but some doubts were felt as to whether the scheme would be sufficiently supported in the way of attendance to make it really worth while. A certain amount of expense is involved in the preparation of lectures, hire of hall, etc., and in view of the many important claims on the funds of the Association, the organisers would like to feel that such expenditure would have some definite propaganda value. Provisional arrangements are in hand for a lecture at the end of November, to test out the possibilities of the scheme; the subject to be "A Review of Modern developments in Model Speed Boats," illustrated by lantern slides, to be delivered by Mr. Edgar T. Westbury. I am inclined to think that the scheme is well worthy of the support of readers, and shall be pleased to hear their views on the subject. A post-card to me indicating that the writer proposed to attend the opening lecture would be of much assistance to the organisers in making suitable arrangements, and would be passed on. It is proposed to hold the lectures at a place readily accessible from all parts of London, and admittance will be free of charge to all who are interested.

Percival Marshall

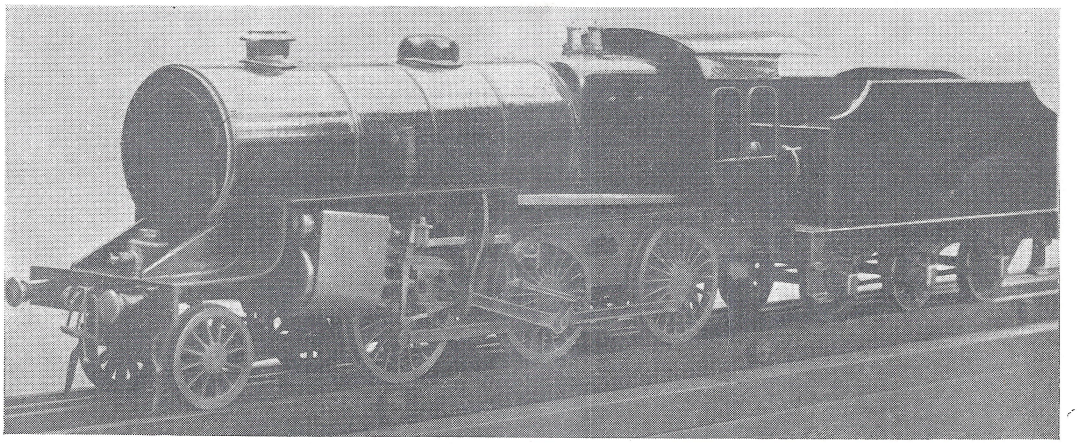
SHOPS" SHED & ROAD

A Column of "Live Steam."

By "L.B.S.C."

A 2-6-0 of Earlier Type.

Although the personal beauty of the earlier 2-6-0's on the L.M.S., built during the previous locomotive superintendent's regime, isn't in the same street with those designed by Mr. W. A. Stanier, the former make up for their somewhat ungainly appearance by the way they set about the job; and, after all, that is the main thing. Some of them, built to suit the Irish gauge of 5′ 3″, are running in Northern Ireland, and I've just received an interesting account of how one ran in competition with another type of engine on the Great Northern Railway of Ireland, and licked its opponent in every way—speed, power, and coal and water consumption. The accompanying illustration of a small sister of this class will therefore be of interest. She is 2½″ gauge, and was built by Mr. Frank Ibbotson, of Bury, Lancs., the job being spread over several years. She is a pretty faithful copy, as you can see. Nothing of particular interest developed in the building, except that Bro. Ibbotson got into a bit of a tangle with the steam pipe arrangements, as the smoke-box goes down between the steam chests. However, your humble servant offered the usual helping hand, and suggested a wangle which got over all the trouble and worked O.K. The boiler, when under hydraulic test, lifted slightly over the firebox at 120 lbs., but made no further move. This is never anything to worry about; as I've remarked before, a boiler made from soft copper sheet, is bound to have a "crease" or wrinkle somewhere in it, and the water test merely irons it out, in a manner of speaking. The regular working pressure is between 70 and 80 lbs.; and on this, the engine hauls her owner quite easily. Friend Ibbotson is rather apologetic about the finish; but taking things all round, I don't think he has over-much to worry about. She's a realistic-looking little barrow, anyway!



Mr. F. Ibbotson's 2½″ gauge L.M.S. "Mogul."

A Clackbox Mystery Solved.

Leaky clacks, screw-down valves, and various other blobs and gadgets seem to be the bane of some of our brothers' lives—at any rate, that part of them devoted to locomotive building—so the following tip may probably "bring relief to some anguished soul." A brother made a check valve that just refused to keep tight. He biffed the ball, reamed the hole on the edge of which the ball seats, and tried everything he could think of; but she just kept on leaking, so in the end he sent it to me with an urgent S.O.S. On taking a looksee I found the fault to be a fairly common one. The small hole at the bottom of the ball chamber had been drilled all right, and opened out with the larger drill; but the D-bit which followed it had just stopped short of cleaning out the bevel left by the cutting lips of the larger drill. At a casual glance from the top, everything seemed O.K., but in reality there was a tiny bevelled section left at the top of the seating hole; and as a drill, used to open out a smaller hole already drilled, often leaves a chattered surface where it has been cutting, this bevel was covered with minute serrations. The ball seated slap in the centre of the bevel, consequently it rested on the serrations, and no amount of biffing would make them lie flat enough to enable the ball to make a steam and watertight seal. Reaming the hole also made no difference, as the reamer did not touch that part of the bevel on which the ball was trying to seat.

I was unable to put the clack right, because the D-bit had already been put well down, and another application would have cut the

clack body off at the ball seat; so I gave our friend the tip and told him to make another clack, this time being certain that the larger drill was not fed in too far, and that the D-bit cut the bevel clean away and left a knife-edged seating on which the ball could be made to sit steam and watertight by a gentle biff.

Screwdown valves will sometimes leak from the same cause, if the angle of the valve-pin cone corresponds to the angle of the drill lips. Whilst a D-bitted seating is the correct way of getting over the trouble, it is not always necessary to make one, unless an extra-quick-opening valve is needed. A cure can be effected by turning the cone point of the valve pin to a longer taper, so that it engages with the edge of the small hole, and misses the "corrugated" seating left by the enlarging drill. This does O.K. for blower valves, donkey steam valves, and other kinds of valves where a more gradual opening is an advantage.

The "Dyak" competition to go on.

Here is an item of news that will bring joy to the hearts of the builders of "Dyak" locomotives. I mentioned in my comment a couple of weeks ago, that the time allowed for completing the engines was insufficient for the majority of tyro builders, and since then have seen Bro. Kennion on the matter, and also been in communication with Mr. Geo. Stevenson. Both agree, and friend Stevenson "has come to the aid of the party," in a way which will bring loud cheers from everybody who appreciates the splendid effort he has already made to encourage locomotive building among beginners. He proposes to offer a silver cup for another "Dyak" engine; any locomotive of this type now being built as a first attempt, is eligible, and engines unsuccessful at the competition just closed, may be altered or repaired as necessary, and entered for this contest. Brer Kennion and myself will put up a second prize; so now, all ye "Dyak" wallahs, slap into it and get busy!

The original rules as to the building of the engines will of course apply, viz., all the job must be the entrant's own work, no finished parts allowed except a steam gauge, and the engines must be a "first attempt" except with this proviso; if anybody has built a first attempt "Dyak" and is not satisfied with it, he can rebuild it or do anything he likes to it, in order to make it successful, and it will be eligible. The idea is to stimulate and encourage locomotive building; and personally, I reckon that if a tyro builds a locomotive full of boners, and finds out and rectifies them, he's learned, by experience, a lesson which cannot be beaten, for it is extremely unlikely that he will make similar mistakes again.

There will probably be more entries for this competition than for the last, so a different scheme for testing out is proposed, in order not to encroach on S.M.E. track arrangements by testing the engines at the Exhibition. A closing date will be announced in due course, and all entered engines will be tested under steam on any convenient track which may be available, such as the new Polar Route, or the Romford line. *Entrants should drive their own engines wherever possible.* The locomotives putting up the best performances will, if our worthy "boss" approves and consents, go to the Exhibition at the Horticultural Hall, and be judged for workmanship in the ordinary way, and the prizes then awarded. The winning engines can give demonstration runs if required, and it will be interesting to see if Mr. Hill's "mighty haul" can be beaten by another tyro.

"Late final"—all locomotives may be fitted with sanding gear, either steam or plain "drop" as preferred, and will be permitted to make full use of it, just the same as their big sisters. I'll give sketches and description of a sanding apparatus in the near future. A full-sized engine of the "Dyak" type (or any other type, if it comes to that!) would be absolutely helpless without a sander.

"Dyak" boiler for oil firing.

I've heard several more tales of woe from "Dyak" builders who did not go in for "casket chasing," but started the engine because they liked its personal appearance. They managed the chassis part all right, and made a bold dash at the boiler, but unfortunately met their Waterloo through not having enough heat to make a job of the brazing. The actual work in building up and brazing a loco-type boiler is not really difficult, as I have tried to explain in past description of the processes; but *heat you must have,* and plenty of it, to make a successful job of brazed joints. "Dyak" boilers *can* be brazed with a 2½ pint lamp or a small gas blowpipe, but it requires packing with coke in a way not many tyros know the trick of, and so they get "almond rock" and leaks in galore. If a five-pint lamp, or oxygen apparatus, is not available, the only thing to do with a loco-type boiler is to braze or silver-solder the firebox seams, silver-solder or Cuprotectic the tubes, and rivet and sweat the outside joints. Many tyros, however, are distinctly chary of using soft solder on their boilers, although it is all right to stop interstices in riveted seams, providing they are always covered with water; and some of these brothers want to know if it is possible to use a water-tube type of boiler, which can be brazed with quite a small lamp, say one pint size, or a small blowpipe.

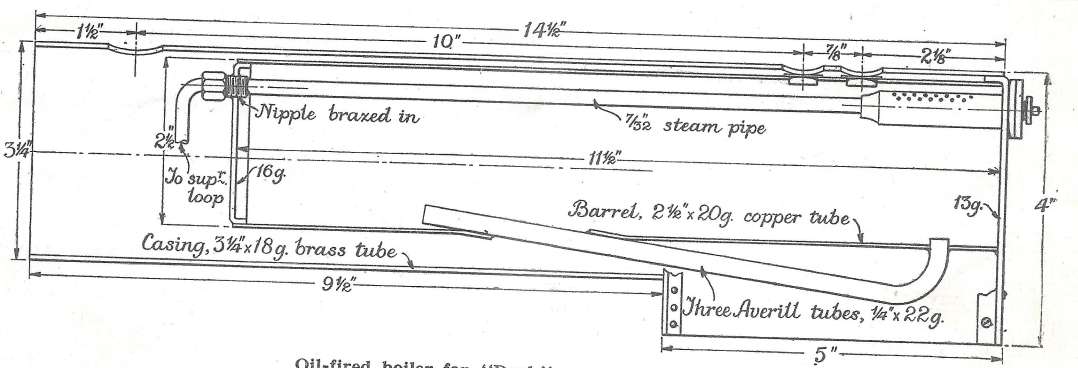
To paraphrase a Westminsterian gem of phraseology (my very best respects and thanks to you, Mr. Nuttall!) the answer is in the positive; denoted by the sign you see on the nurse's arm and the first-aid box. Here is a sketch of a suitable doings. Unless it is required for the sake of personal appearance, the Belpaire wrapper can be dispensed with, and the casing made from a length of 3¼" brass tube, about 18 gauge, split and opened out to form the firebox casing. This should suit those good folk who are building the engine as a L.N.E.R. "Mogul," as these engines have a round-topped boiler. The bottom edge of the firebox casing can be left straight; there is no need for it to go very far down between the frames, as these, being deep, afford the burner all protection necessary. The smokebox shell is in one piece with the barrel. The backhead is knocked up over a former in exactly the

same way as the loco-type backhead, from 3/32″ sheet copper, and on the inner side of this is brazed a 2½″ by 20 gauge copper tube as shown in sketch. The front end is closed by a flanged disc of 16 gauge copper, brazed in. For both the backhead and front joints, use brazing spelter or easy-running strip, in preference to silver-solder. The latter may, however, be used to fix the three Averill water tubes, which should be ¼″ diam. and 22 gauge. Soften before bending, and bend with your fingers, so as not to get kinks in the tubes.

As to fittings, no dome is required, but you can braze in a couple of bushes to accommodate a pair of safety valves, same as the loco-type boiler, and drill holes in the casing to let them pass. A regulator flange can also be brazed or silver-soldered into the backhead, plus some small bushes for gauge glass, blower valve and two feed clacks. No bush is needed for the whistle turret, as the hole for the stem of this can be tapped through the backhead flange; and the thickness of this, plus that of the barrel, affords a good hold for the threads. The regulator valve itself may be the same as on the loco-type boiler, but only a short tube is needed, 2″ or so, and this is perforated

front part of the barrel, into which it is brazed. The connection is made to the clack by an elbow. If the feed loops are made first and fitted with the elbows, and then brazed into the boiler, they are easy to couple up. Two holes are drilled in the casing, just large enough for the elbows to stick through; then when the inner barrel is inserted into the casing, a little wangling will coax the elbows through the holes, after which the clacks are screwed into them with a touch of plumber's jointing on the threads. I might mention that a hot feed makes a wonderful difference to the maintenance of steam on a water-tube boiler, and the loop heaters are well worth the trouble of fitting.

The front end of the casing is closed by a door and ring, same as the smokebox front of the loco-type boiler, and the whole bag of tricks is mounted pretty much in the same manner, except that you needn't bother about links for the rear end, but can run a couple of screws through frame and casing. On a water-tuber, oil or spirit fired, the frame gets much hotter than it does with a loco-type, and expands along with the boiler. If you are going to paint the engine, it is advisable to line



Oil-fired boiler for "Dyak" type engines.

with about two dozen 1/32″ holes at the top, to let the steam in without causing priming. The steam pipe goes out through an asbestos-packed gland on the front plate, and is bent around the firebox casing and back to form the usual superheater loop, before going to the steam tee. The blower is fixed up same way as on the loco-type boiler; ditto the water gauge.

There are alternative methods of arranging the feed. The simplest way is to bring a pipe back along the frame from the pump delivery union, and put a tee in it, stem upwards, under the footplate. A pipe leads direct from the stem of the tee to the clack on backhead, the by-pass cock being placed directly behind the tee and operated by the usual handle. The feed from the hand pump is taken to a separate clack. If, however, you like to take a little more trouble, some of the heat, instead of being wasted in the outer case of the boiler, can be utilised for heating the feed. Two clacks are attached to the casing, same way as those on the loco-type boiler, and the feed pipes connected in the same manner. From the inside stem of the clack, a pipe goes along between boiler and casing, is looped at the end over the flame of the burner, and passes back to the

the firebox casing with sheet asbestos. Blast-pipe and chimney arrangements need just as careful setting as with a coal fire, if correct steaming is desired; use a chimney liner as for the loco-type boiler, and the same arrangement of blast pipe and blower, so as to pull the burner flame along as far as possible between casing and barrel, and make most use of the heat.

If you want to work the boiler to its full capacity, and have no objection to plenty of noise, buy a "Vesuvius" paraffin burner as used on painters' blow lamps. Adams, Buck and Ryan, etc., sell them, and they only cost a couple of shillings or so. Fix up a tank in the tender, with pump and release valve, as shown in the Live Steam book, and arrange the burner to shoot its flame on the slant, over the top of the trailing axle, and play between the water tube bends on to the inside barrel. Mr. Purdey's "Kingette" has this arrangement, and it steams four cylinders without effort, so it ought to make the water-tube "Dyak" jump like a scalded cat. If you want a quiet burner, make up a two-jet axle-dodger, also as described in Live Steam book, and set the back flame tube as close behind the trailing axle as possible, the front flame

tube being arranged midway between the trailing axle and the throat plate. Speaking of axle-dodger burners, several brothers who have made these, complain about the vaporising arches getting rapidly carbonised up. This isn't a serious defect, as they can be renewed in twenty minutes or so; but at the same time it is usually a case of dirty paraffin. If the paraffin is strained, it should burn cleanly. A mixture of paraffin and petrol, or petrol alone may be used, and is much safer than in an ordinary painter's lamp, as the tank is separate from the burner; but a little larger nipple is required than for paraffin alone.

First Steps in Model Engineering.

Workshop Advice, Experience and Philosophy for Readers of all Ages.

By "INCHOMETER."

Unfinished Work.

This topic has come into my thoughts by reason of prolonged and considerable study of the models on view at the recent "Model Engineer" Exhibition, and by some enquiry into the circumstances pertaining to the model maker, his equipment and place of working. From this I have been forming mental pictures, imagining that I could see the model engineer working at his model, understand his thoughts relating to it, and realise the impelling motive which has determined the state of his exhibit as staged at the Exhibition. Merging the recent show with those preceding it, into a conglomerate whole, there were exhibits complete in all respects, others nearly completed, some in a half stage of construction. With completed models, instances of first rate construction and finish, to say 90 per cent. or more of the whole, yet having a leaven of inferior, inappropriate or out of proportion detail.

To you, taking, perhaps somewhat indecisively, your first steps in model engineering, I offer some considered reflection about unfinished models and other constructions, possibly those who have far advanced may derive a new perspective. Even the medal winner, if he should chance to read, will possibly find addition to his stock of philosophy and some broadening of the procedure, liable to accompany intensiveness of purpose.

Mind and Matter.

Model making, general mechanical construction and workshop hobby, tends to vitrefy desire to finish the particular work being undertaken at the time being. My drift of life, during a long period, has carried me to numerous amateur workshops and acquaintanceships with the home mechanics habiting them. Treasuring, as I do sincerely, recollections of invariably genial welcome given to me, hospitality, intellectual conversations and observations, and enjoyment of viewing and examining a range of construction and appliances, the entity of models and model engineers has become incorporated into my very being. Observing the characteristics of these workers and their modes, and listening to sayings from their philosophy, as well as opinions about models, workshops and tools, have presented a store of knowledge to which I am grateful. The wise sayings and actions have grafted upon my inner consciousness, influenced my opinions and guided my course of decision and action. There is a dictum urging that one should finish whatever one has begun before commencing upon another undertaking or piece of work. With the majority of ourselves, this has been imposed by our preceptors in youthful days. From the view point of educational training, it may be necessary, so as to inculcate perseverance and concentration, and to discourage frittering of effort upon a number of momentary fancies. But for yourselves, I consider that you need not allow the matter of finishing to be an obsession. If you have become tired of the particular work, leave it alone for a while, if you do not feel the urge to set about it again. Disregard any jibes about not completing what you have started, commence to make something else, and cheerfully, even more than one new attempt.

An artist painter works at several pictures, maybe of necessity to allow pigments to dry and set, for reasons of light, or because he must be in the suitable mood for working at any particular one of them. It is one of my personal kinks to be pleased in contemplating incompleted work. A different feeling of enjoyment to that given by a completed work. Probably you will have a sense of this special pleasure when taking out something which you have put away partly made, and after a lapse of time, give another look at it. Even though you decide, through more recent experience, that it is not worth finishing, you will have some enjoyment in re-examining it, and knowing that it is your own work. Then, having decided never to complete, you will possibly revert to it, maybe after several years have passed, and by altering and adding, produce a finished work to your own satisfaction. The human mind is of infinite complexity in its workings, it is a subtle thing and should be given respect in its demands. We may be obliged to impose force upon it through external influences and desire engendered by these influences. In your workshop and hobby, let your mind have its own way, be directed by its natural reasoning. If it tells you not to work, or not to proceed, to abandon, continue or to change, obey its pleading and be happy in doing so. This lesson I gained one evening when in the home workshop of a famous amateur model engineer.

Like Painting a Picture.

Now all this philosophical meandering has come about because I visited the "Model Engineer" Exhibition. Similarly, to the Mr. Dick in one of Charles Dickens' stories, who could not leave King Charles's head out of a petition he was preparing, I cannot get the Exhibition and its teaching out of my

brain. Intending to write about technical matters of work and tools, my pen, it seems, automatically scribes a dissertation of metaphysical nature. The art of ease in making a model is to liken procedure to that adopted by an artist in painting a picture. He starts by preparing the surface of his canvas or paper for the media which will be superposed upon it, to delineate or depict the whole subject. Elementary preparation is the commencement, by suitable colour of suitable density and in broad treatment. After this, he will paint in the sky effect, distance and background, then the middle distance and middle ground, and lastly, the near distance and foreground. If one contemplates the intended model work similarly, and a course of construction divided similarly into definite stages, there will be a sense of repose and orderliness during the evolution from the constituent material. As a painter is assisted by the general aspect of his picture at each stage in directing its harmony and construction, so with a model, each stage will, by parallel imagination, afford opportunity of correcting, balancing and adjusting towards a meritorious completion. If a painter takes to model construction, he generally produces agreeable models and derives intense enjoyment, with consequent beneficial relaxation. He proceeds leisurely, giving ample survey to the construction at its various states of advancement. Sense of balance, harmony, proportion and correctness of detail persists, and may cause him to leave the model aside at stages of incompleteness until he can find the needed authoritative information. His professional methods, practice and training in producing pictures, conduct his method in model making, though he may not be aware of this. Practice in machine drawing is likewise of value from the same point of view. It impresses system and development sense, trains one to plan general arrangements and orderly fixing in of details.

Error in Measurement.

Referring again to the lecture by Col. A. F. Marchment, mentioned in "First Steps" of October 3rd, on "Testing and Rectification of Machine Tools," perhaps my paragraph may induce you to test your lathe, or other machine, with a view to discovering if any errors in alignment, or other fundamental, are existing. If you are endeavouring to determine within very small amounts, fractions of one thousandth of an inch, as with Col. Marchment's tests, caution is necessary. The observed indication given by the measuring instrument used may not truly express an error. You will, lacking knowledge and experience, rely implicitly upon the reading given by the pointer or the scale marks, but it may be wrong. A micrometer or a sliding gauge may indicate small or large owing to contained error peculiar to itself. The error, perhaps, is initially there when the instrument was new, may have developed through wear, improper handling, or be due to temperature. A dial instrument may have an ascending error, that is, when the pointer moves along the scale from zero. There may be a descending error, as the pointer moves downwards towards zero. The two errors can be different in amount or sign and be unlike. In his lecture, Col. Marchment emphasised this by mentioning that a considerable amount of his time and results had been nullified, on one occasion, by reason of the pointer of a testing indicator being loose on the spindle. Also, he properly cautioned that testing depends upon the person engaged upon the examination, as well as with the instruments and conditions obtaining at the time. If you are testing or indicating to a fine degree of measurement, be cautious in accepting indications as definite proof, and slow to bestow complaint or blame on the evidence you may have obtained.

For the Bookshelf.

Workshop Practice. (A Revised and Enlarged Edition of E. Pull's "Modern workshop Practice"), by F. Johnson Taylor. (London: The Technical Press, Ltd.) Price 16s., postage 6d.

The revision of this well-known and exhaustive treatise on mechanical engineering has been carried out in such a way as to preserve the original character of the book, while bringing it fully up to date and incorporating new material on the latest tendencies in industrial methods. Properties of alloy steels and cast irons, and procedure in machining them, are fully dealt with, and extra space is given to modern gear cutting machinery and gear testing. In place of the section dealing with hand forging, drop and machine forging is treated, and a chapter is devoted to welding in its various aspects.

A Comprehensive Treatise on Practical Mechanics. By J. M. Lacey. (London: The Technical Press, Ltd.) Price 18/-, postage 6d.

This work is intermediate between elementary principles of mechanics and advanced theoretical works. It comprises three sections, Part I dealing with Newton's laws and general principles; Part II, Statics, and Part III, Dynamics. As an introduction to mechanical science for students of engineering, this book will form a reliable and useful guide.

Popular Pocket Diaries for 1936. (London: Iliffe & Sons, Ltd.) Bound in leather cloth, complete with pencil, price 1s. 6d., postage 2d.

"The Wireless World" Diary

This contains a great deal of technical information on wireless receivers, including hints on minimising interference, up-to-date circuit diagrams, data on all types of valves, symbols in common use, tables, formulae, etc.; also a list of European broadcasting stations, the world's principal short wave stations, and particulars of receiving licence regulations.

"The Autocar" Diary and Handbook of Motor Sport.

Racing regulations at the principal race tracks, and detailed information on records, tables of speed, distance, r.p.m., racing tyre sizes, sparking plug data; in short, everything of interest to the motor racing enthusiast will be found in a concise form in this diary.

PETROL ENGINE TOPICS

Controversial Matters.

By EDGAR T. WESTBURY.

NO doubt most readers are familiar with the old fable of the two valiant knights who, approaching an inn from different directions, stopped to admire its gaily painted sign. One referred to it as a masterpiece of gilding; the other begged to correct him, but declared it was silvered. An argument followed, leading eventually to a bloodthirsty duel; and when at last they lay on the ground exhausted with pain and exertion, the landlord of the inn, who had been a witness of the proceedings, but had discreetly foreborne to interfere, came out and explained that the sign was gilded on one side and silvered on the other!

So it is with many, if not the majority, of technical arguments. Apart from really fundamental facts which, after all, are just laws of physics, there are no rigid rules which are applicable to all cases. I remember a well-known photographic writer who said that in photography, black and white were only to be regarded as variations of tone values; and so in engine design, right and wrong have no absolute definition, but are relative, not only to each other, but also to the general scheme of things. What is bad practice in one case may be quite good in another.

I have made it a rule, when attempting to dispense information on model petrol engines, to avoid making dogmatic statements. To my mind, progress is only hampered by an attempt to put an undeveloped science on "railway lines," although many people try to do this, and are often acclaimed as experts as a consequence. There is never a lack of disciples to the prophet who makes definite statements, though he cannot prove them, and definite promises, though he has no power to fulfil them. For myself, I confine definite statements to what has or has not occurred in given circumstances, and such inferences as I make, are generally accompanied by the reasons for making them, so that readers can sort them out for themselves. Many will say that this policy betokens lack of either knowledge or moral courage, or both; and up to a point I plead guilty to both impeachments.

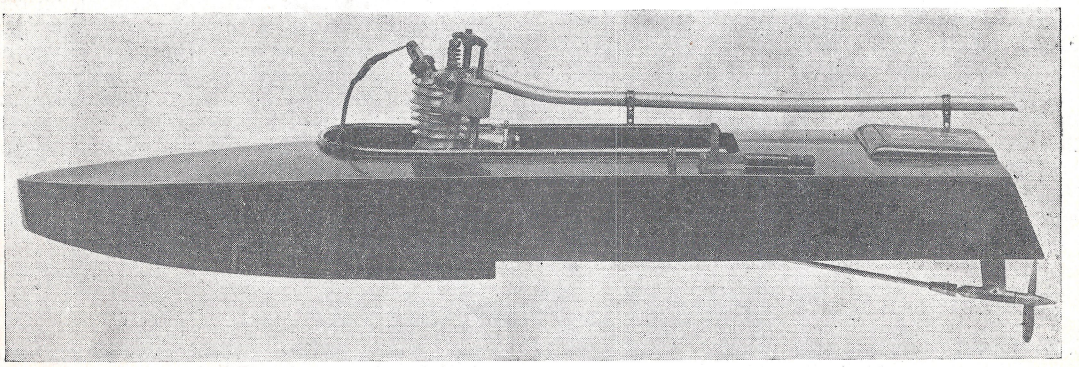
I am submitting below a few notes compiled from recent questions I have been asked, where in my opinion a clear-cut answer has not been possible. In some cases the correspondents have had very pronounced views on the questions concerned, and it has not occurred to them that there may be two (or even more) different answers to them—both right!

These samples represent only a few of the controversial points which arise, and I hope to deal with others at a later date.

Air v. Water Cooling.

The cooling problems on model engines are not very different to those encountered in full size practice, and the pros and cons in each case depend similarly on questions of environment and convenience, but there are one or two cases where experiences with large engines may be misleading. For instance, few full size motor boat engines are air-cooled, and it may quite logically appear to be the height of folly to air-cool an engine, when unlimited cold water is available for the purpose; but experience shows that it is often much simpler to dispense with the assistance of water and rely on air currents.

Cooling is a practical necessity in I.C. engines, because the extremely high working temperature obtained in the combustion head would otherwise speedily destroy the lubrication, and the mechanical properties of the piston, cylinder, valves, etc., but at the same time, thermal efficiency demands that as little heat as possible should be conducted away. In water-cooled engines, it is usual to arrange for the water to be heated to only slightly below its boiling point, and even so, it would be better still if a higher temperature could be attained; in some cases this has been done



A miniature speed boat made by Mr. L. W. Kent, of the Swindon Power Boat and Engineering Club, fitted with 15 c.c. four-stroke engine, as described in "Petrol Engine Topics." This boat ran for the first time in the M.P.B.A. Grand Regatta.

by the aid of fluids which have a higher boiling point than water, or by closing the water circulation system so that the water boils at a higher temperature, on account of the pressure generated.

In a large engine, it is not very difficult to ensure that the cooling water is delivered at a temperature approaching the working limit, and in some cases this is controlled by means of a thermostat; but in a small engine, it is quite a problem to strike the happy medium between overcooling on one hand, and complete evaporation of the water on the other. Generally, small water-cooled engines in model boats run much too cold for good carburation, apart from thermal efficiency.

There are one or two very notable cases where water-cooling has been employed in speed boats with great success, but the majority of users regard it as unnecessary, and even a potential source of trouble. It is by no means unknown for pumps to break down, or water passages to become choked, while the difficulty of running the engine for more than a few seconds when the boat is out of the water will be obvious. Suggestions have been made several times that the water might be circulated in a closed circuit, instead of taking it from the pond, and cooled either by means of a radiator or a kind of keel condenser, but I have not seen this tried out in practice. It would certainly appear to offer possibilities in eliminating some of the possible troubles, and also in keeping the temperature under better control.

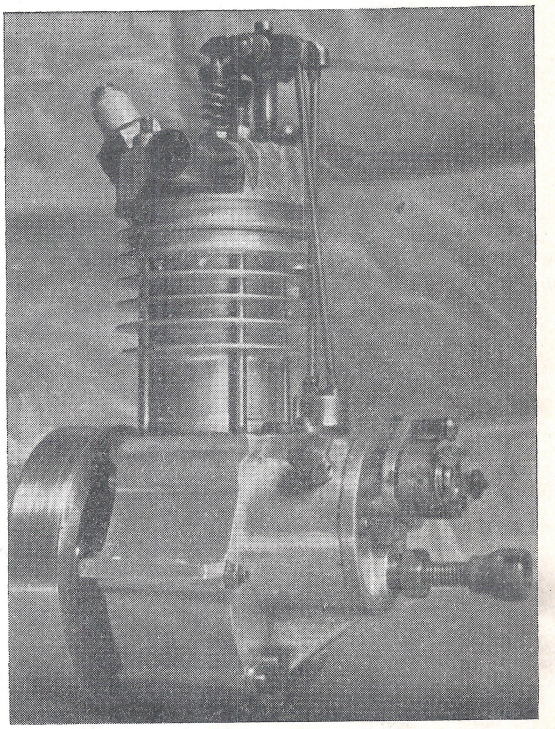
There is at present no evidence, so far as I am aware, that water-cooling is capable of entirely removing the possibility of internal overheating, in cases where engines have to develop their maximum power. One factor which influences this is that in the case of air-cooling, the radiating properties of the cylinder and head increase as the temperature rises, but a water-cooled surface, should it become hot enough to boil the water in immediate contact with it, builds up a blanket of steam, which is a more or less effective heat insulator. To disperse this, very rapid water circulation must be kept up, and control of temperature is thus made more difficult.

My arguments have tended to go against water-cooling, but at the same time it is possible that we may arrive at a stage where we cannot possibly dissipate the heat generated in an engine in any other way. I must confess to a partiality towards air-cooling, because of its evidential value in experimental work. The temperature of an air-cooled engine cylinder head is, like a dog's nose, quite a good indicator of its internal condition, but unless accurate calorimetric measurements are made, the variations in waste heat are not so apparent in a water-cooled engine.

Two-Stroke v. Four-Stroke.

I have on several occasions expressed my views on this old controversy, and so far as the general characteristics of the respective engines are concerned, it may be said that while the four-stroke generally has a higher power output in relation to its displacement, the two-stroke, though of lower volumetric efficiency, may have a better power-weight ratio. I am speaking now of the best observed examples of both types of engine.

A two-stroke, while comparatively simple in construction, demands perhaps more care in design, and certainly more patience in tuning up to its highest efficiency, than the four-stroke; the latter is fairly straightforward to design, and its adjustment is more amenable to logical treatment, but it contains many more parts, all of which require to be accurately made, and to work together in perfect co-ordination. I would not like to hazard a guess as to which engine will ultimately be developed up to the highest efficiency, but I have a weakness for the two-stroke, which I believe to have really better power characteristics, and also—though



Another 15 cc. engine constructed by Mr. D. Innes, of Manchester, from home-made castings.

many people may dispute this—less definite limitations than the four-stroke.

If you are out to obtain results quickly, my advice would be to use the four-stroke engine, but if experiment is in your blood, and you take a delight in doing what others declare to be impossible, then you will find the two-stroke a proposition worthy of your steel. With a combination of intelligence, perseverance and good luck, you may aspire to achievements equal to those of Mr. Rankine or Mons. Suzor, whose successful attempts to improve upon two-stroke performance deserve sincere admiration.

Some time ago I heard it stated that, although some remarkable performances had been attained by means of two-stroke engines, they were best left alone, unless you were an expert. How one was to become an expert by leaving them alone was unfortunately not explained.

I would not have it believed that there is less scope for intelligence in developing the four-stroke engine, however; the problems which arise in attaining high efficiency are quite as difficult and as absorbing; though, I submit, not so utterly illogical and bewildering as with the "simpler" power unit. If I may be forgiven for once indulging in a dogmatic utterance, I would state that no man can claim to be really familiar with either type of engine, until he has done quite a good deal of work on both!

Large v. Small Ports.

Seekers for efficiency in model petrol engines are, quite rightly, very much concerned with the size of the ports for charging and exhausting the cylinder. To say that I am walking on thin ice, in attempting to give advice on this subject, is putting it very mildly indeed, but my views on the matter have so often been the subject of expert criticism that I expect those "in the know" have given me up as hopeless long ago. Let me say, however, that I do not think they would dispute my advice, if they would only realise that it is intended for those who really need it; in other words, the advice one would give to the expert—assuming, of course, that he would have any use for it—is different to what would be most useful to the worker who is as yet struggling laboriously up the ladder. In case anyone says that only one sort of advice can be the right sort, I refer them to the opening paragraph of this article.

Now, in forming ideas as to the size of ports in an I.C. engine, we must carefully avoid forming inferences from port sizes in steam engines. Even in the latter, opinions are by no means unanimous, but to take any analogy from an engine which is simply a converter of fluid pressure into mechanical power, is a dangerous fallacy. I mention this because one or two correspondents have apparently based their conclusions on these lines.

It will be quite obvious to anyone that the more mixture one can get into the cylinder of an I.C. engine, the more powerful will be the subsequent explosion, and the more speed or power will be obtained from the engine. Large ports are apparently the simplest methods of ensuring the maximum volume of mixture; they also allow of the exhaust being very freely expelled, and reduce the throttling effect at very high speed. So that, other things being equal, an engine having large ports should be far more efficient and speedy than one with small ports.

Unfortunately, however, "other things" seldom *are* equal! The functioning of an I.C. engine depends on the combination of a number of diverse effects, and cannot be compared to that of either a steam engine or an air compressor. It is generally appreciated that the momentum of both the incoming and the outgoing gases plays a very important part in the efficient charging and evacuation of the cylinder, and as momentum depends upon mass multiplied by velocity, it will be fairly obvious that as both mixture and exhaust gas have very small mass, they must move at very high velocity. There would not be the least difficulty in this, if we could run our engines at very high speed, and if your engine is of such excellent general design and workmanship that you can be quite assured of this, by all means use large ports. But there are many problems, mostly mechanical, in running engines so fast, and another point which I am always driving home is that it is one thing for an engine to be able to run fast, but quite another for it to be able to *accelerate* up to speed against a dead load, and under the very worst conditions of carburation and ignition, which can only be partly mitigated by the use of delay action devices, or similar expedients.

The gentle art of compromise must be exercised in these problems. If we go all out for exceptionally high revolutions, and fit bigger ports with correspondingly bigger valves, the latter will require stronger springs to close them; the operating gear will require to be stiffened up in proportion to operate against the stronger springs and increased valve inertia, plus (in the case of the exhaust valve) greater pressure, on account of increased surface of the valve. Again, all this stiffening up increases the inertia of the valve gear generally, rendering the conditions for high speed more difficult, and it is possible to get into a vicious circle from which there is no apparent escape. The art of design consists in the reconciliation of these incompatible factors, and if you are a clever enough designer to do this successfully, it is quite clear that you are in no need of assistance from me; I frankly admit that I have not mastered these problems, but am still wrestling with them more or less hopefully.

In the case of the two-stroke engine, conditions are not quite the same, as the valve gear problem does not arise, and large ports do not affect the mechanical efficiency to any great extent. There is still, however, the problem of accelerating the engine against load, but owing to the better torque characteristics, this is not quite so serious. Lubrication is one of the most difficult problems in a really high-revving two-stroke, and big ports increase the wastage of oil, and the breakdown of the oil film on the piston. There is no doubt whatever that big ports are a necessity in efficient fast two-stroke engines, but port design is such a problem that one can best progress by starting with medium-sized ports, and enlarging them gradually and discreetly during the progress of tuning, and as one's experience develops.

The general characteristics of a big port engine are: ability to run at very high speed, but poor pulling at low speed, and sluggish acceleration, also slow recovery if temporarily overloaded. Adjustment of timing, tappet clearance, and carburation is critical, and there is usually a tendency to "temperament"—in fact, the engine exhibits the traits, both vices and virtues, of its high breeding. The small port engine is definitely "woolly" in performance, and may lack snappiness when flat out, but has the ability to accelerate quickly or to plug away merrily when overloaded. It has no delicacy in adjustment, and generally gives a consistent performance, dependent, of course, on mechanical and other factors remaining the same. While a large port engine prefers a comparatively small, fine pitched propeller, the small port engine seems to

flourish on what is often facetiously referred to as a "windmill."

The conditions relating to the sizes of choke tubes in carburettors follow much the same rules as valve ports.

And now, readers, it is for you to decide; my advice to those who are not quite certain of their ability to design and construct really super-efficient engines is—make your ports small at first; you can easily open them out if you wish.

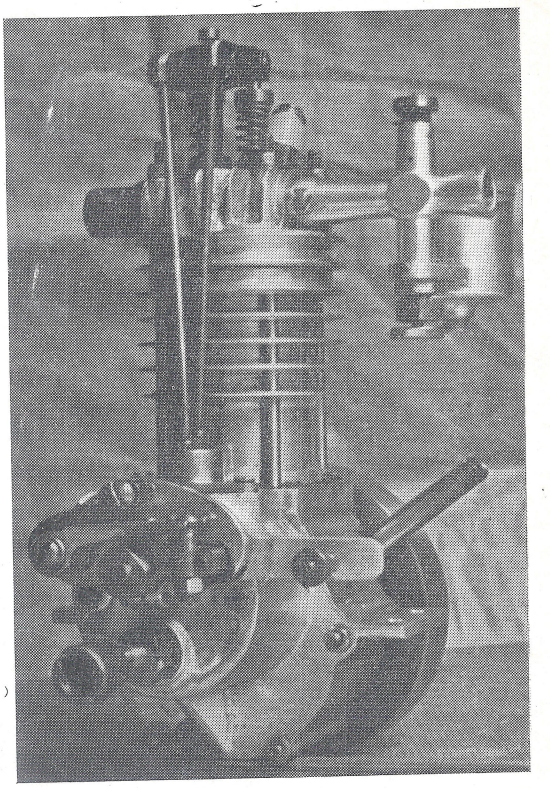
"Plain v. Coloured."

Everyone building a petrol engine with a view to high efficiency performance will, of course, wish to take full advantage of every modern development in design and construction which will further this end. There are, however, many features in engines nowadays, which are certainly advantages when employed in the light of considerable experience and knowledge of design, but may be quite the reverse when the designer does not thoroughly grasp their principles. I have on several occasions been almost moved to tears by the sight of engines which the designers believed to be on "advanced" lines of design, without having more than a vague idea of why such lines were, or ought to be, advanced or improved.

The "plain" engine will very often perform much better than the "coloured" one, if the designer's knowledge is limited, and moreover, if its essential mechanical design is sound, it can be afterwards fitted with alternative improved features, such as cylinder heads, etc., with the advantage that the improvement in performance can readily be checked. Do not aim beyond what can be ascertained as real established design at first, but concentrate on sound mechanical design and good workmanship. I have referred before to the number of requests I get to produce a design for a "super" engine which would, it is considered by the proposers, form a short cut to record-breaking performance by the inexperienced builder. Apart from the impossibility of being able to guarantee any such thing, I would not do so if I could, being too much of an individualist to lay down stereotyped lines of design, much less a complete design to represent "the last word."

I will confess that I should be rather sorry to see model petrol engine builders go all "highbrow," and get very worried about the molybdenum content of the steel for their conn. rods, the octane numbers of fuels, or the acceleration curves of their cams. These things may eventually become necessary, but for the present I think we may well leave them to the specialists who really understand this jargon, or who manage to convince us that they do. Nowadays, even the garage hand who sells you a quart of oil puts over a heavy line about the physical properties of its various constituent hydrocarbons, fully aware that you do not know any more about them than he does, but that the subtle flattery to your intelligence is a good pathway to further sales.

Not only would the cult of the "highbrow" type of engine put its construction out of the reach of most amateurs, who have no access to means of properly working or heat-treating super metals and alloys, or precision machining



Driving end of Mr. Innes' engine, showing carburettor and contact breaker of his own design.

of weird profiles, but it might even be a retrogression, for there is no substitute for real experience. This is not a revival of the old argument of theory v. practice; theorise as much as you like, but do not wander off into the clouds without keeping a good anchor embedded in solid earth. I am quite sure that we have by no means explored the full possibilities of the good old "plain," honest-to-goodness type of engine yet!

Developments in 15 cc. Engines.

The little 15 cc. four-stroke engine which I described early in the year has proved very popular among readers, and I have news of several, either under construction or completed. One was shown in the competition section of the "M.E." Exhibition, and I am informed that in its essentials it exactly follows the published description, and has turned out quite up to expectations in performance. Another made its debut at the M.P.B.A. Grand Regatta, where it made a very promising first run. Yet another, somewhat modified in detail, has been produced by Mr. D. Innes, of Manchester, who made his own patterns and castings, the metal for the latter being melted in the kitchen fire.

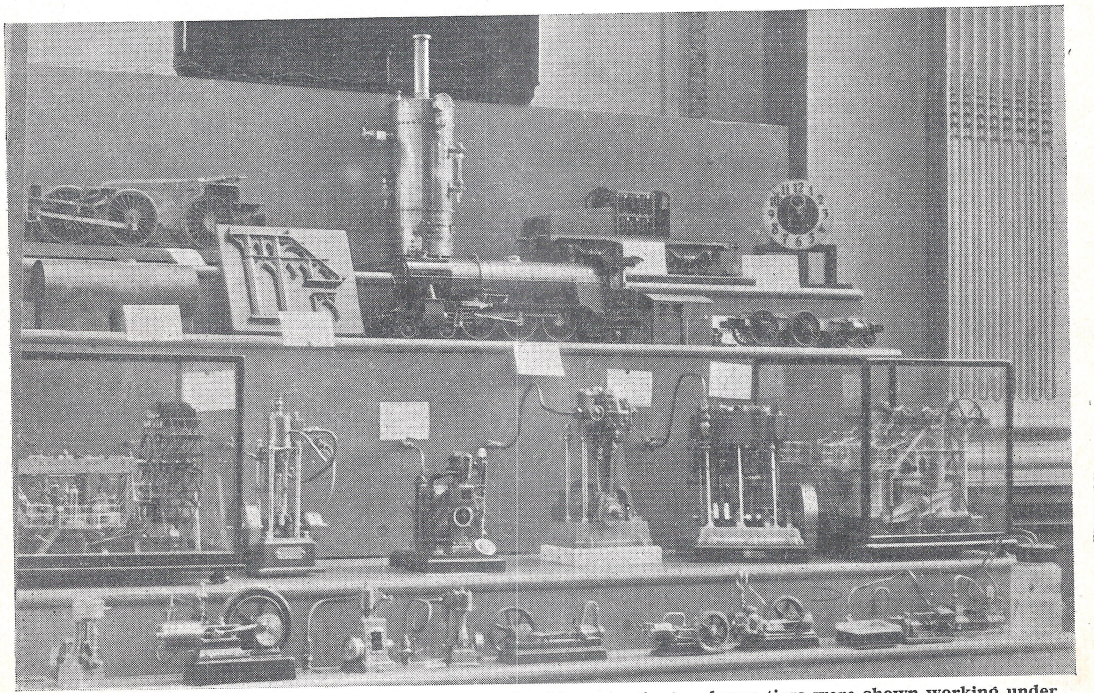
I take the liberty of mentioning this, because this little engine provides some sort of evidence of the truth of my foregoing contentions. The engine is of the small port type (valve ports only 5/16" dia.), and its construction is on the very simplest lines, though mechanically sound; and the result is moderate, quite consistent and reliable performance.

Society and Club Exhibits at the "M.E." Exhibition.

THE various model engineering and kindred clubs which were represented at this year's Exhibition provided excellent proof of the flourishing state of model craft generally, for their exhibits, though perhaps not more numerous, were more varied and of a higher order of merit than ever before. The Society of Model and Experimental Engineers, whose activities in connection with the passenger-carrying track provide one of the great attractions of the Exhibition, carried out their non-stop service without a hitch, aided by the biggest fleet of locomotives that has as yet been available. Their collection of models, many of which were shown working under compressed air, grows larger year by year, and prominent in this year's selection were Lieut. W. T. Barker's reconstructed side lever marine engine, recently described in the "M.E.," Mr. H. H. Groves' "Fayette" locomotive, and Mr. D. H. Chaddock's electro-magnetic dynamometer for testing small I.C. engines. The workshop section of the S.M.E.E. stand exhibited signs of great activity throughout the period of the show, and if the steel shavings festooned across the wire screen were to be regarded as a sample of the cuts taken, they were evidently working on a production basis.

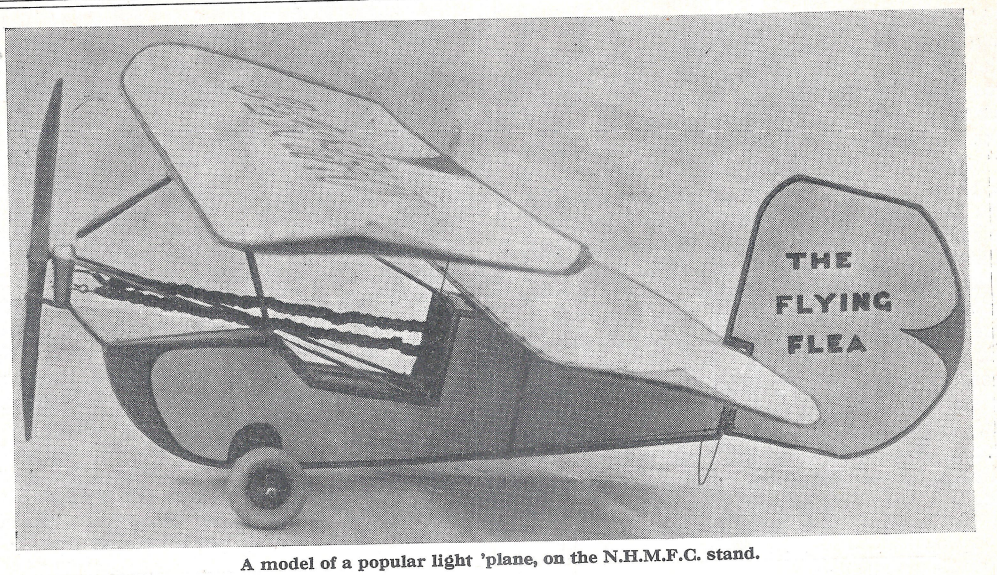
On the Model Railway Club's stand, in addition to a large collection of small gauge locomotives and rolling stock, complete, or in the course of construction, was a section of "O" gauge track, on which models were frequently demonstrated. Model railways in "O" and "OO" gauge featured on the stands of the Wimbledon and District Model Railway Club, Ilford and West Essex Model Railway Club, the Finchley Model Engineers' Society, and The Model Engineering Club. Some of these were laid out complete with scenic properties and equipment for automatic signalling and control, which was demonstrated continuously. The Ilford stand in particular attracted a continuous crowd of admirers.

The Romford and District Model Engineering Club, in addition to several excellent examples of model locomotive construction, featured a steam driven hydroplane, and also speed boat engines, both steam and I.C., complete and partly constructed. Kent Model Engineering Society showed, among other models, some good locomotives, a steam driven hydroplane, a group of finely constructed scientific instruments, a case of ultra-miniature steam and electric models, and some parts for a model traction engine which displayed uncommonly good workmanship.



Some of the models exhibited on the S.M.E.E. stand. Those on the two lower tiers were shown working under compressed air.

Aircraft models worthy of special mention, include the petrol-driven monoplane by A. and A. M. Willis, winner of the Sir John Shelley Cup and Concours d'elegance, 1935, and Mr. H. E. White's "Hornet" racing plane, on the S.M.A.E. stand; a distinctly new type of power plant on the T.M.A.C. stand, consisting of a lightweight electric motor driven by a specially light lead-acid accumulator, which can be charged from a dry battery, and retains sufficient charge to drive the motor under full load for over 30 secs. It is stated that successful flights have been made with the aid of this



A model of a popular light 'plane, on the N.H.M.F.C. stand.

motor. The Northern Heights Model Flying Club exhibited Mr. C. A. Rippon's pusher-type petrol-driven machine, Mr. H. E. White's flash steam plant for model aircraft, and a model "Flying Flea," by Mr. L. H. Sparey, which appeared to be a fairly correct representative scale model of the prototype, and is probably the first model of this machine to be constructed.

The Model Yachting Association's stand featured some exquisite examples of sailing craft, including some of the latest racing models, which have figured meritoriously in recent competitions; also examples of model yacht construction and rigging, some fine paintings of clipper ships, and literature on model yacht racing specifications and rules.

Model power craft of various types were shown on the stand of The Model Power Boat Association, including prototype, speed boats for straight and circular course racing, and two examples of "miniature" speed boats.

Screwing Short Studs in the Lathe.

By H. DYER.

ONE of the most disagreeable jobs which fall to the lot of the writer is as above. With the aid of a tailstock die holder, it is possible to make a fair show of one end of a stud, but if it be short, with little or nothing to grip in the chuck but the threaded portion, the usual result is a defaced thread at that end. Of course, one may quite simply screw one end in the lathe and afterwards (having done all the "one ends" in such manner) grip in vice by clams, and screw the other in the die stock. I must plead guilty to using this method many times, but it leaves a lot to be desired as regards the accuracy of the last threaded portion—a point which will be brought forcibly home to one if the mating holes in the component to be secured are accurately located in relation to one another and also a close fit. So we'll relegate such haphazard methods to the limbo of things best forgotten, and make a gadget that'll do two jobs as and when desired.

Firstly, as a stud adapter and collet for the lathe nose, see sketch No. 1. This is made from a piece of B.D.M.S., cast iron or hard brass. Dimensions of the main body as per sketch. Cut to length and face both ends, leave in chuck after second facing, centre, drill and bore to a shade less than the root diameter of the lathe nose screw. In the case of sketch, bore right through $\frac{3}{4}$". Somewhere about half way, recess the clearance groove internally for the screwing tool to finish in, and then bore out the outer end to such diameter as will clear the lathe nose shoulder. It is best to measure the hole in a chuck or face plate to get this right. Use the best fitting one you have, and notice if the threads have any marking whatever in this recess. The writer can just trace the marks of the maker's screwing tool in his own 1" back plates. If you can do this also, carry on screwing until you just touch this clearance at the end, remove chuck bodily and try for fit. If snug, put on chuck again and take another cut, using the requisite amount of care—think twice before you cut once. Anyway, this job ultimately finished, proceed to cut off a number of lengths of steel $1\frac{1}{2}$" long by 1" diameter. These are for the screwed collets. Grip $\frac{1}{2}$" in chuck and carefully reduce the stock to such dimensions as will enter the outer end of adapter smoothly, and then drill out a tapping size for either $\frac{3}{8}$" whit, or B.S.F. This thread may be left-handed if you fancy it, but in the writer's case, an ordinary right-hand thread has proved quite O.K. Produce this hole towards the "stud" end of collet to such length as will suit the stud intended. For a $\frac{3}{8}$" stud, stop short $\frac{3}{8}$" clear; for a 5/16", leave

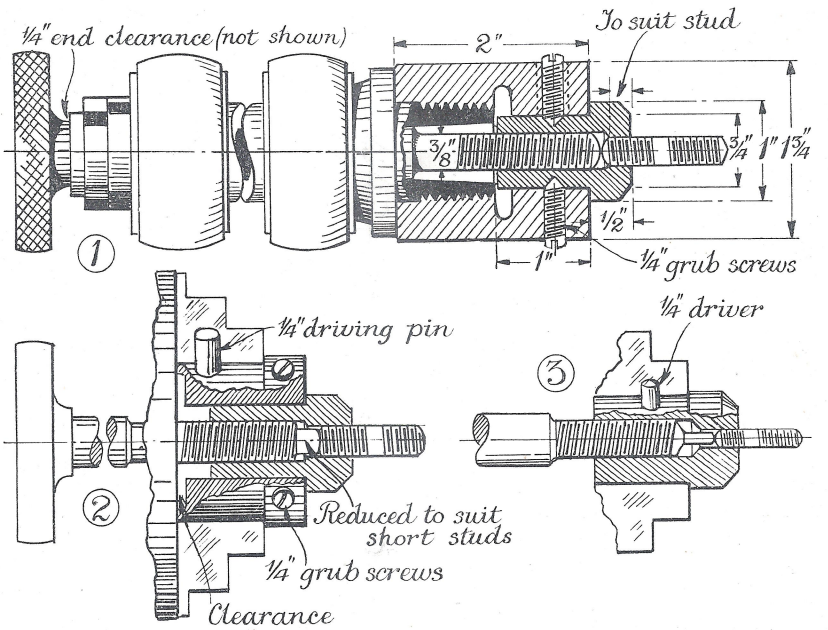
5/16″, for a ¼″ and 3/16″, allow a ¼″, and so on down to ⅛″, or as far as you desire the range of collets to go. Drill and tap for either two or three grub or set screws for securing collet against rotation, and that finishes the main parts. The screwed "push-spindle" as opposed to "draw spindle" should be of such length as will show about ¼″ clear at end of mandrel when the former is in the "home" position. The main part should fill the hollow mandrel, whilst the screwed portion should be as sketch, or to suit maker's desires. Allow ample clearance here again in the "home" position. There remains only the hand grip—anything a bit "eye-able" will do, but it is a lathe fitment, so try and keep its appearance as neat as possible. *Anything* just isn't *good enough* by itself. Quite good fitments may be made from ordinary items with a bit of "dolling up," the final result being worth the little extra trouble.

No. 2 is very similar to No. 1, but dispenses with the screwed nose fitting, using instead, a suitably machined block gripped in chuck, and with a driving peg against which one of the jaws engages—No. 1 jaw for preference. Recess the face at back, so as to bed fair against chuck face, and reduce slightly to give ample chuck grip. Drill and tap for driving peg and fit same. This may be ¼″ (or 5/16″ if you like to be sure of the "drive"). Locate in chuck and proceed to bore out, afterwards always locating by same jaw as for boring and facing outer end. Mark collets also. The collets have been dealt with already in No. 1, and also the push spindle. You can vary the push end, if you desire, to coincide with sketch No. 2, but this isn't necessary, the only advantage being, that in the smaller sizes, one may have more threads in the collet for accommodating a longer stud, but still be able to grip a very short one, by reason of the reduced end of the "push" rod actually entering the screwed portion. This can be as the reader desires, and is open to modification at will.

No. 3 shows simply a plain screw collet directly gripped in chuck, a peg taking the drive, as in No. 2. It is simply a lazy way of doing either Nos. 1 or 2, and in small sizes leaves a lot to be desired, as the peg cannot be so solidly housed in the wall of collet as in former case, *and the external diameter, being more in the general run of sizes chucked in the S.C. chuck, comes within the range of inaccuracies of the particular chuck used.* No. 2 coming around the 1¾″ dimensions, more rarely used, is likely to run truer. No. 1 is independent of such chucking being "Nose" fitting. N.B. Drill a 5/16″ or ⅜″ tommy hole at any position clear of lathe nose for removal of adapter. The final operation in all three cases is the drilling and tapping of the collets for studs. Locate each of the three styles as for use, previously marking each collet so as always to be correct in relation to its adapter (or chuck jaw in No. 3). Centre, drill and tap from the tailstock chuck. In the case of the larger and coarser threads, first get a thread or so of the tap engaged by the tailstock tapping method, and finish the job in the vice, using suitable clams.

Once the tap is through, replace the collet in the lathe, and the tap in tailstock chuck, and run in and out a time or two, using slow single gear and plenty of oil.

Regarding the second use for the gadget, as mentioned at the beginning, the maker will find it handy for chamfering, rounding and otherwise operating upon the heads of bolts and screws, whilst at the same time retaining the accuracy of the threads.



Three types of chucks for holding small studs.

A Design for a 1½" Scale Four-Coupled Shunting Tank Locomotive.

By GEORGE GENTRY.

(*Continued from page 379.*)

The Smoke Box Joint Detail.

In dealing with constructional details of the boiler, one of the principal joints is that of the smoke box fixing, taken in relation to the front tube plate or drumhead joint. Fig. 26 illustrates this to a scale of full size, and indicated as a section on the vertical diameter of the boiler barrel.

As seen in Fig. 24, the drumhead is inset $\frac{15}{16}$" from the front barrel mouth to front of tube plate. The edge of the plate is turned outward to a full $\frac{5}{8}$" total width, making a joint surface (annular) of about $\frac{7}{16}$". Midway of this is put the circular line of $\frac{3}{16}$" copper rivets, which are spaced about $\frac{3}{16}$" centres. Calculating this out on the circle of the joint, which is inside the barrel, or on a $5\frac{3}{4}$" diameter, the barrel must be divided nearly enough into 32 equal divisions, to give this pitch. By the same rule, the rivets in the rear barrel joint (i.e. that made to the bossed out flange circle of the throat plate of firebox shell), are to be spaced out on a 6" circle, the joint being on the outside of barrel. In this case, the dividing comes between 33 and 34, but it would be better here to adopt 33 divisions, to avoid the tendency to overcrowded snap heads on the inside of barrel.

With this joint properly made—and in later notes reference will be made on how to caulk this boiler—the accessory joint of the smoke-box is made as indicated in the same figure. The smokebox is to be constructed throughout in 14 S.W.G. copper plate, and its fixing ring is to be set this thickness, nearly enough 5/64", inset from the barrel mouth, but on the outside. The ring, accurately fitted by boring to the outside of barrel, a drive-on fit, is of gunmetal angle section $\frac{7}{16}" \times \frac{7}{16}" \times \frac{1}{8}"$ finished thickness. It is secured to the barrel by $\frac{1}{8}$" G.M. hexagon-head set screws, tapped in the barrel, and passing through close-fitting clearing holes in the web of the angle ring. The flange face of the angle ring is faced flat, and to it is fitted the equivalent of the throat plate of the smoke-box. The smokebox wrapper, at this point, wraps round the edge of throat plate, and is jointed by means of $\frac{3}{8}" \times \frac{3}{8}" \times \frac{1}{16}"$ G.M. angle,

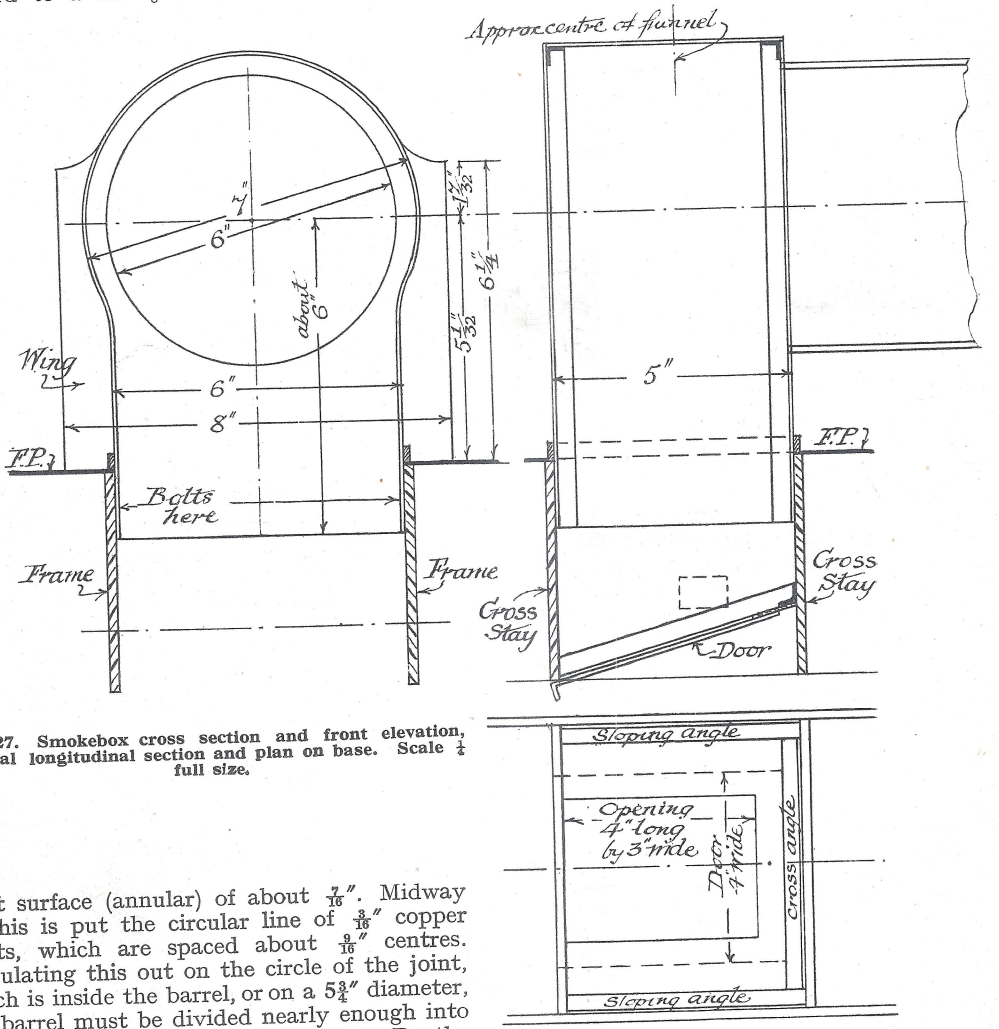


Fig. 27. Smokebox cross section and front elevation, vertical longitudinal section and plan on base. Scale ½ full size.

snap head and tail copper rivets on the joint to the wrapper, and $\frac{1}{8}$" G.M. studs, tapped to the flange, and passing through clear holes in throat plate and angle flange, and so nutted with G.M. nuts on the inside of smokebox. According to Mr. Simpson, these rivets are pitched at $\frac{1}{2}$", but this should be the minimum distance, in this case. The point is that all these joints—barring that of the drumhead, which is subjected to 100 lbs. per square inch steam pressure—are subject to external air pressure not exceeding, or even reaching, 14 lbs. per square inch, and this only during exhaust beats, the idea being to maintain as good a vacuum as possible in the smokebox, for the purpose of maintaining air feed to the fire and

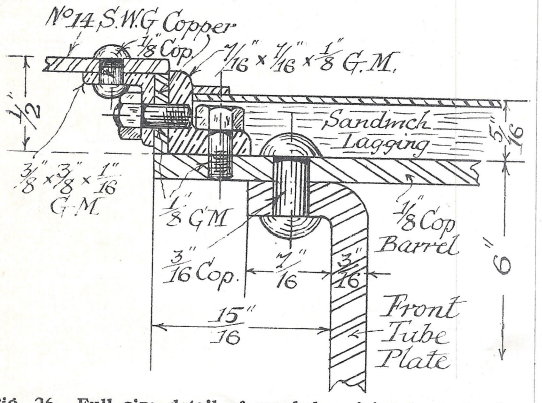


Fig. 26. Full size detail of smokebox joint to nose of boiler barrel.

through its grate. With this quality of jointing in view, it brings us to the constructional details of the smokebox.

The Smokebox.

Taking the view to the left of Fig. 27, which is a composite section looking into boiler barrel, on which is superimposed, in elevation, the front plate of smokebox, we see the 6" opening in the throat plate taking the boiler barrel. No indication is given of the jointing—already described—to avoid confusion. The wrapper being set out $\frac{1}{2}$" to its outside from the barrel, makes its diameter at the circular part 7" on the outside, and about 6 27/32" on the in. This shape, as seen, is necked down to 6" wide on outside by a 2" radius curve on the outside also. It is then carried down, rectangular on plan, made up of the front plate opposite the throat, and the two sides or horns of wrapper, down to a point 6" below boiler centre, and thus forms a planting stalk which houses in to a rectangular box formed between the frames by cross stays (see right hand views). This planting portion goes about 1" below the top edges of frames, and the front weight of boiler and box are taken by $\frac{5}{16}$" × $\frac{1}{8}$" steel strips, riveted along the wrapper, and resting on inside edge of footplate at the sides; and by $\frac{3}{8}$" × $\frac{1}{8}$" strips, similarly riveted, across the front and throat plates, and resting on the top edges of the cross stays, fore and aft. The front of boiler, and indeed the whole boiler, is secured down to the frame by a row of bolts and nuts (say about three per side and three each across, fore and aft, making 12 in all), which bolts pass through the copper box and the frames and cross stays, to effect the setting.

The number of bolts suggested is given to ensure making an airtight joint at this point, but, as a matter of stability, no doubt eight would do if the initial planted joint were very well fitted.

The bottom of smokebox is made sloping, downwards towards front, about 15° to horizontal (not more, otherwise the rectangular exhaust from cylinder, shown dotted at approximate position, will not be included). This sloping bottom, of 14 S.W.G. steel, is secured to the frames, in inside, by $\frac{3}{8}$" × $\frac{3}{8}$" × $\frac{1}{16}$" steel angle riveted to same, both ways, and by an obtuse steel angle of same size similarly riveted to the back cross stay and the bottom plate. The latter slopes down flush with bottom of front cross stay, and is made with a 4" long by 3" wide opening, sealed by a steel sliding door, set in steel edge runners on the side edges and on the underside of the bottom plate. This door is lipped as shown, and, to prevent its shaking open, an out of balance metal button is pivoted on front bottom edge of front cross stay, and so checks the door from shaking open. By lifting button, and drawing the door, the spark ash can be emptied from bottom of smokebox.

There is more to this matter, but it will be noted that the front butt joint of the bottom plate, if well fitted, needs no angle, being covered in the main by the door and runners, and, further, being sealed by the fine ash in corners. For the moment, it is as well to note that the *front* cross stay of this box can be made for preference of $\frac{1}{16}$" steel plate rather than $\frac{3}{16}$", the reason for which will appear in the next instalment.

(To be continued.)

A Simple Method of Marking Out Crankshafts.

Make a pair of end plates, and secure firmly at the ends of the shaft, in the usual manner. Next pack up the shaft on the lathe cross slide to centre height, and secure it with a couple of bolts and a plate; the shaft centres should now correspond exactly with the lathe centres. Measure the T.P.I. of the cross slide guide screw, then by turning the handle the correct number of turns, the exact throw of crank is obtained, also in the same plane as the main shaft.

Wind the sliderest by the lead screw towards the head stock, until the end plate just touches the centre, and move up the tailstock to just touch the other end plate; these centres will indicate the position of the crank centres, and by lightly tapping each plate, should mark them sufficiently for centre-popping and counter-sinking in the ordinary way.

The end plate at headstock end can be centred right away, by inserting a fluted centre or Slocombe drill for the plain one, and feeding up the work by the lead screw.

This is a simple way of marking out a crankshaft when no surface plate, vee blocks and scribing blocks are available for marking out in the orthodox way.

R.A.

MODEL MARINE NOTES

Experiments with a Flash Steam Turbine-Driven Boat.

By R. HAINES.

ABOUT eighteen months ago, a friend of mine, Mr. G. J. Scoles, tried to persuade me to construct a flash steam turbine-driven boat, but as I did not think that a simple De Laval turbine, of the type suggested, would develop sufficient power to drive its own feed pump, to say nothing of a propeller, I would not be persuaded. Some days later, however, he produced a very crude windmill-like thing, complete with force pump, and a flash coil, which he proceeded to heat over the gas stove, drawing water from a saucepan underneath. On starting the plant, the turbine took up the load of the pump, and accelerated to a very high speed. The steam, meeting the blades, produced a very high-pitched musical note until the coil flooded.

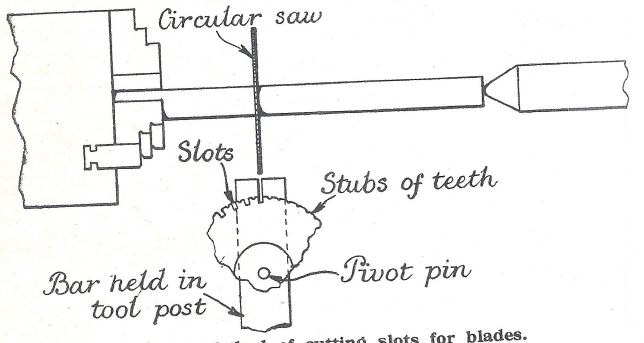
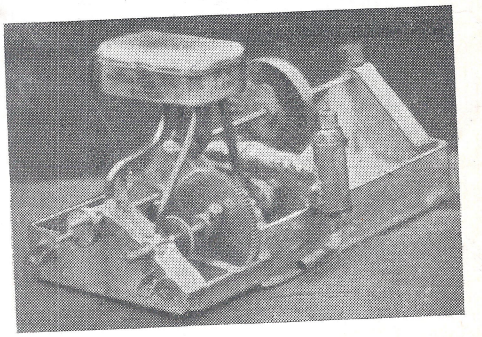


Fig. 1. Method of cutting slots for blades.

This demonstration completely converted me, and we started on the design of a plant, deciding after much argument, on the following dimensions; rotor 2¼″ overall diam.; rotor disc of 1½″ diam. brass; blades 5/16″ long by ¼″ wide brass; number of blades 30, soft soldered into radially cut slots 5/32″ deep in the rotor disc; rim of 2¼″ by 1/16″ copper tube; feed pump 5/16″ bore by 1″ stroke, of the normal ball valve type. The gear reduction from rotor shaft to propeller shaft is 5:1, and from propeller shaft to pump drive shaft, 5 2/3:1. The base was constructed first, this being the most straightforward part of the job. In order to combine rigidity with lightness, it was built up from 28 s.w.g. tin plate, soft soldered and triangulated throughout. Brass bushes were fitted for bearings, which were lubricated by oil drawn from a sump by a gear pump.

The rotor shaft was a 6″ length of 3/32 silver steel. Work on the rotor was then commenced, by attempting to cut 30 radial, and equally spaced slots in a 1½″ by ¼″ brass blank with a hacksaw, and by bending and filing up the blades from brass strips. As a means of making a true rotor, these methods were soon discarded, and a 60 tooth 1½″ diam. 3/16″ faced brass gear used as the rotor disc, and



A view of the completed power plant.

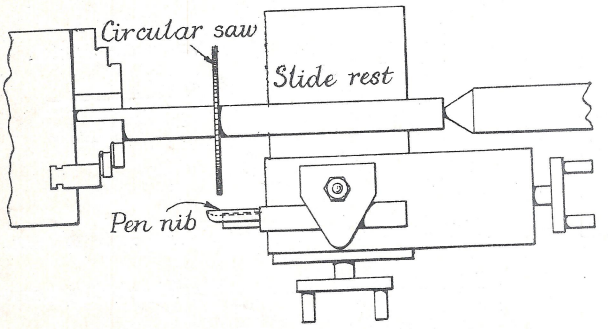


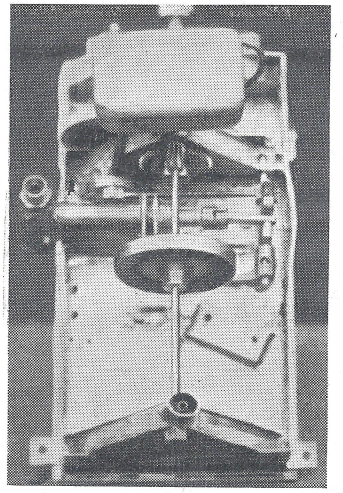
Fig. 2. Method of cutting nibs to length.

"Relief" pen nibs for the blades. The teeth of the gear were first turned away (see Fig. 1), to leave small slots to act as locating notches for the circular saw, which was fitted on a spindle in the lathe. Then the gear itself was mounted on the slide rest by means of a simple jig, consisting of a piece of steel bar having a pin over which the gear fitted. The bottom slide of the rest had a stop set to give a 5/32″ cut in the gear when it was fed up to the saw. To index the slots, the gear was rotated on the pin, two teeth in relation to the saw for each cut. The pen nibs were then cut to length by mounting them on another "jig" consisting of a piece of ⅜″ brass rod, turned down at one end for a length of 17/32″ to fit radius of the nibs. Next, the rod was mounted in the slide rest (Fig. 2), so that the turned down end just cleared the saw. The nibs were then held on to the "jig" by pliers, the plain end being

pressed against the shoulder, thus ensuring the blades being cut to an equal length. They were then assembled to the rotor disc, by fitting them into the slots, and soft soldered. The rim was then skimmed out and fitted over the blades.

Next thing was to fit the rotor, which was of 5/32″ bore, to the 3/32″ shaft; this was done by soft soldering on the shaft a brass bush, which was turned to size by holding the shaft in the chuck and supporting it in the tailstock. The same method was used to fit the 10-tooth gear to this shaft.

The rotor and shaft assembly was then balanced by letting it roll freely along two level knife edges, set the width of the rotor apart. Holes were drilled in the heavy side of the rotor disc, until an almost perfect static balance was obtained. On being assembled to the base, which had the pump, gears, etc.



Another view of power plant, taken from above forward end.

fitted, the rotor could be revved past its critical speed by turning the pump drive shaft by hand. Up to its critical speed, the rotor and shaft whipped badly, but once centred, they appeared to run dead true; there was a complete absence of vibration, and the power required to keep the rotor turning was considerably less.

25 ft. of ¼″ steel tube was then coiled up to form the boiler, and a 1½″ diam. burner blow-lamp was made of usual design.

After many bench tests, the plant, as it was not expected to be powerful enough to drive a hydroplane, was fitted in a double-ended hull 4′ 9″ long by 7″ beam. Using a 3″ propeller, this boat attained speeds up to about 15 m.p.h., but heeled over badly through propeller torque. Several quite successful runs, however, were obtained, but owing to the general weakness of its construction, this rotor was, in view of the high r.p.m. obtained, never felt to be really safe. These fears proved to be well founded, as this rotor, when on bench test, after a rather short but hectic life, burst, through centrifugal force.

This necessitated a new rotor being made, which is the one at present being used; it is entirely of steel, silver-soldered, and has no balancing holes. Its construction is otherwise similar to the deceased one, the differences being that a 30 tooth steel gear is used for the rotor disc, and steel pen nibs bought at a certain well-known store for 6 a penny as the blades. The points of these nibs are broken off, leaving a point on each side, which act as guides when fitting to the rotor disc. Before cutting these nibs, they were softened, and before assembling to the rotor, they were thoroughly cleaned, in order to remove the scale which appeared whilst heating them, and would prevent the spelter running properly.

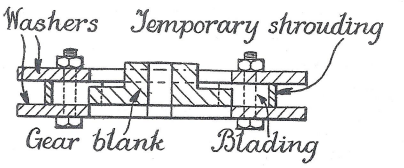


Fig. 3. Rotor assembled in jig before silver soldering.

In order to support the blades whilst silver-soldering to the rotor, the job was clamped between two steel washers, as shown in Fig. 3., the spaces between the blades were packed loosely with short lengths of asbestos string, in order to prevent the spelter running up the blades This method of setting up proved satisfactory, resulting in the blades being true to the disc, the spelter running right to the edge, but not up the blades. To ensure getting the rim true to the rotor, lead was now cast round the blades, which were turned down to project 5/16″ from the rotor; the latter was turned on an arbor for this purpose. The lead was then melted out, and a rim 3/32″ thick by 5/16″ wide turned off a mild steel gear blank to fit over the blades. A slight ridge was left at one side for the blades to seat on. The rim was then silver-soldered in position, turned down to a 1/16″ thick, and faced

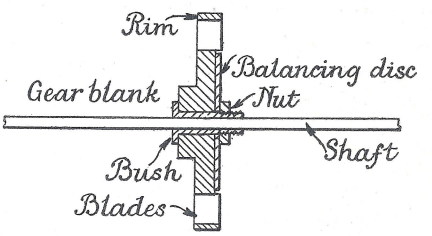


Fig. 4. Method of fitting improved rotor to shaft.

off flush with the blades, the ridge being turned away.

This rotor is mounted on an ⅛″ silver steel shaft, as shown in the general arrangement drawing, being balanced by a gunmetal disc clamped to it, which is lightened by filing away one side to obtain the necessary balance (Fig. 4). The effect of using a larger shaft is to raise the critical speed, but as much less whip occurs, it centres more easily.

In order to avoid the torque trouble, the hull is now fitted with twin 2½″ propellors. The

boat runs quite reliably, the plant giving very little mechanical trouble, but being too powerful for the type of hull used, causes it to lose all sense of direction at about 12 m.p.h.

I have not yet fitted a casing to the rotor, which would greatly increase its efficiency, or experimented with different sizes of jet. The type so far used is of the normal De Laval pattern, with a throat diam. of .033", expanding to 1/16" in an $\frac{1}{8}$".

The turbine has several advantages over the reciprocating engine as applied to flash steam, among them being the entire absence of "steam-tight fits" such as are required by pistons, cylinders, and valve gear, etc., hence, as there are no sliding surfaces in contact with the steam, one of the main disadvantages of a flash steam plant is overcome, namely the lubrication. The turbine has no reciprocating parts, valve gear, or ports to limit the maximum r.p.m. obtainable; nothing to wear out, except bearings, gears, etc. which are easily replacable, and common to reciprocating engines. When fitted with a hand pump, the turbine is self starting, and gives a smooth, vibrationless torque.

I am convinced that a well-made flash steam turbine driven hydroplane would be capable of record speeds. I sincerely hope there will be a return to flash steam as the power for model hydroplanes, and should this be so, in my opinion, it should be in conjunction, not with the reciprocating engine, but with the turbine, which is more suited to withstand the high pressures, and temperatures that are almost inseparable from a flash steam coil.

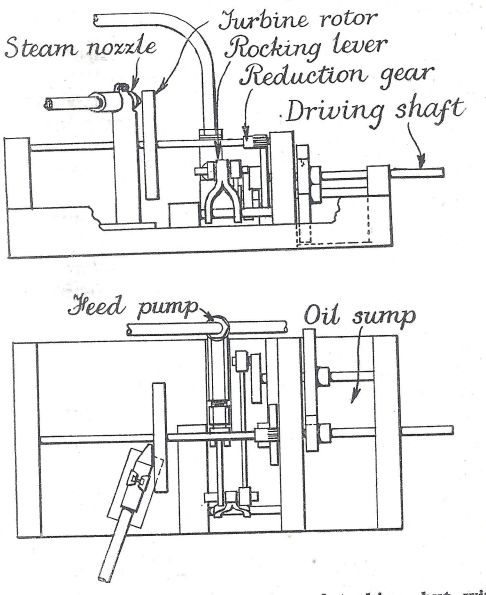


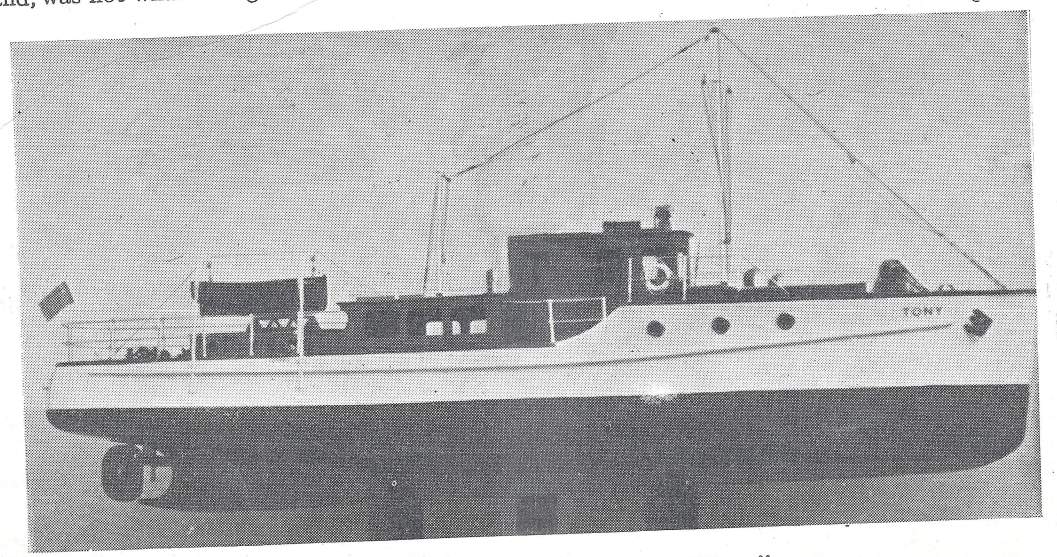
Fig. 5. Plan and side elevation of turbine, but with lubricating system not shown.

In the Wake of the Power Boats.

By THE SPECTATOR.

FOR several years now, the Model Engineer Exhibition has marked the close of the official model power boating season, the Grand Regatta being held on the Sunday following the closing of the Exhibition.

The Grand Regatta following so closely on the Exhibition, may possibly account for the fact that the display of boats on the M.P.B.A. stand, was not what it might have been. While there were one or two outstanding exhibits taken as a whole, the display was neither representative nor particularly interesting. As one who has at one time and another had quite a lot to do with exhibitions, I know that it is no easy thing to get exhibits for these stands, and at the same time, be sure that they will be up to scratch from the only mildly interested visitor's perspective; usually, the responsible



Mr. Eastaugh's steam-driven cabin cruiser "Tony."

organiser finds himself on the day before an exhibition, either with no boats at all, or with about three times the stand's capacity.

An outstanding exhibit on the M.P.B.A. stand was Mr. Eastaugh's "Tony," a steam-driven cabin cruiser of superlative design and finish. During the exhibition, this boat was subjected to keen scrutiny by many visitors, who, without exception, pronounced it to be one of the best examples of *practical* model power boat building they had seen. The design is complete, without being too fragile for actual running, as its performance at the Grand Regatta proved.

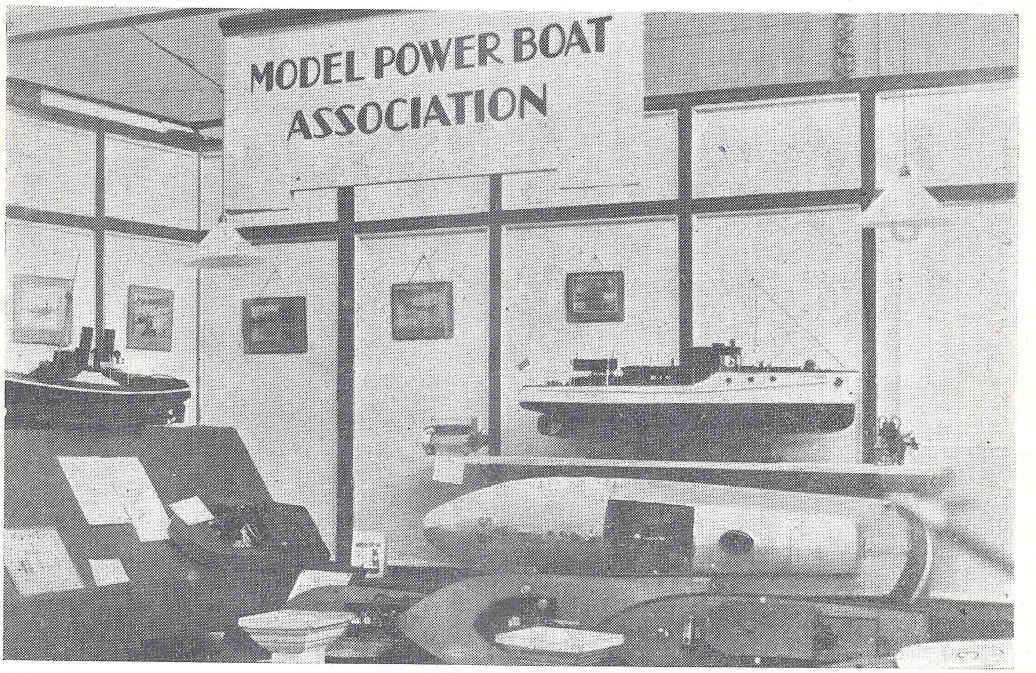
Mr. Vine's flash steamer "Silver Jubilee," also attracted much attention; the engine room is a fine example of neatness and efficiency, with its very complete lubrication system. This latest effort of Mr. Vine's is even larger than its predecessor, and the way it is taken about to various regattas is a testimony to its builder's muscles.

Mr. Savage's unfinished four-cylinder petrol engine presented something out of the ordinary in small engines, and was much admired by the more knowledgeable of the visitors. Mr. Cockman's twin-cylinder flash steam engine is something of a departure from the usual run of these engines; each cylinder is single-acting, twin piston valves of considerable length being operated via bell-cranks and connecting-rods, from the end of the crankshaft; the cylinder block is mounted on an aluminium crankcase, while considerable attention has been given to the lubrication system.

Mr. Skingley's electrical timing apparatus gave visitors some idea of the attention that is given to get accurate times of racing hydroplanes on the circular course.

The M.P.B.A. stand was a rallying point for model power boat men from all over the country who visited the exhibition, and certainly served a good purpose in allowing the exchange of news and ideas from the various clubs.

As far as the rest of the exhibition was concerned, there were few exhibits which fell in the power boat class. The 15cc. hydroplane "Syrupia," was quite a creditable effort of 16-year-old D. B. Purchas. Mr. G. A. Dunn's "Flying Fury," is a stepless flash steamer of very simple lines, though if the speed of 20 m.p.h. claimed for it was actually obtained against a stop watch, Mr. Dunn is to be very heartily congratulated. The rest of the marine exhibits were primarily picture boats, and strictly speaking, did not fall into the power boat category. This rather noticable falling off in power boat entries is rather a pity, but may be accounted for by the fact that builders of these boats realise that there is really insufficient in them to give even a remote chance of one of the premier awards. For the next "M.E." Exhibition, I hope to give an award for the power boat which, in the consideration of the judges, best represents a boat that is of practical design, whether a speed boat or prototype model; a boat which will produce in some degree the performance its type demands.



The M.P.B.A. stand at the "M.E." Exhibition.

The Model Power Boat Dinner.

This semi-official dinner which is assuming the importance of an annual event, was held on the last Saturday in the basement restaurant of the Horticultural Hall, and was honoured by the presence of the M.P.B.A. president, Mr. Percival Marshall. Besides members of the London clubs, there were visitors from Altrincham, Kettering, Oxford, and New Zealand, the latter being represented by Mr. H. H. Stewart.

QUERIES and REPLIES

Querists must comply with the Conditions and Rules given with the Query Coupon in the Advertisement Page of each issue.

6,504A.—Windings for Electric Clock.—A.G.D. (Lower Edmonton).

Q.—I am much obliged by your reply to my previous enquiry, No. 6,504, and now enclose a dimensioned drawing (not reproduced) showing the proposed arrangement of the parts for the synchronous motor. Would you kindly state whether the winding previously suggested will require modifying, and offer any criticisms on the design in general?

A.—Your method of providing a multipolar field by means of two hollow steel cups, with teeth formed on the edges which interleave with one another, is ingenious, but there are one or two objections which you may have overlooked, and which might be found rather troublesome in practice. In the first place, the use of solid magnets on alternating current invariably gives rise to considerable heating from eddy current losses, and even if the circular core upon which the coil will be wound is laminated, as proposed, it does not overcome the liability of the rest of the structure to overheat, since the magnetic flux traverses the whole of it. Generally speaking, the dimensions shown on your sketch are far in excess of those commonly met with in synchronous clock movements, and the inertia of the moving permanent magnet armature appears to be very high. As regards the exciting coil itself, there should be ample room for 3 oz. of wire, consequently its gauge can be increased considerably, and instead of employing No. 49 as formerly recommended, you could now come down to No. 44 SWG. enamel covered copper, which is a much more reasonable proposition to handle.

6,755.—Difficulty with Car Dynamo.—H.S. (Cambridge).

Q.—I have a 12-volt 12-ampere 2-pole 4-brush car lighting dynamo coupled to a ½ h.p. petrol engine. After running for a few minutes, lighting a 36-watt lamp satisfactorily, the dynamo suddenly ceases work, and although I have had it tested at the local garage, who report that it functions perfectly, I am still unable to get it to generate.

A.—If the dynamo works at all, there is no reason why it should not continue to do so, provided you keep the speed constant and there are no loose connections. Are you sure that your shunt field circuit is continuous, and that the connections do not get loose with vibration when running? Also, examine the brushes, and make sure that they are free in the holders, and that the spring pressure is sufficient to keep them down in good contact with the commutator when running. These dynamos will work without the car battery being coupled up, but under such conditions, they have no self-regulating properties as regards voltage, which will rise far beyond the normal if only one or two lamps are used. When the battery is coupled on, any tendency for the voltage to rise is counteracted by increased armature reaction, due to the heavy charging current which results, so that the voltage remains more or less constant. Without the battery, it is quite easy to burn out the lamps, because there is nothing to keep the voltage to a constant level, except by careful adjustment of the speed, or else by inserting a variable resistance in series with the shunt field circuit. You will find a detailed explanation of the self-regulating action of car dynamos in A. H. Avery's "The Motorist's Electrical Guide" 3/10d. post free from our book department.

Business Enquiries and Replies.

Small Milling Cutters.

Q.—Will you kindly let me have a few addresses in and about London where I could obtain small milling cutters to cut gears 20 pitch, and to cut a worm wheel 18 teeth and ½ in. circular pitch.

A.—We would refer you to Messrs. Geo. Adams, 283, High Holborn, London, W.C.1; Messrs. Buck and Ryan, 310-312, Euston Road, London, N.W.1; Messrs. Buck and Hickman, Ltd., Whitechapel Road, London, E.1.

(Falmouth, 861.)

Dial Gauges.

Q.—I wish to enquire from you if you can put me in touch with makers of dial gauges, which read specific gravity of a liquid (e.g., motor car battery condition).

A.—Baird and Tatlock, Ltd., 14, Cross Street, London, E.C.1.

(Spondon, Nr. Derby, 864.)

Centrifugal Pump and Electric Motor.

Q.—Kindly let me have names and addresses from where I can obtain a centrifugal pump and electric motor, suitable for operating a small garden fountain.

A.—A. W. Gamage and Co., Ltd., Holborn, E.C.1; Whitney and Co., 129, City Road, London, E.C.1.

(Pownall Park, Wilmslow, 865.)

"Lark" Lathe Tools.

Q.—We understand there is a lathe tool on the market, named "Lark," and we should be pleased if you would give us the maker's name.

A.—H. Williams and Son, Lark Road, Cambridge Heath, London, E.8.

(Sheffield, 866.)

Cylinder Rods and Pistons.

Q.—I should be pleased if you could tell me where I can purchase 2 cylinders, rods and pistons for an aquarium aerator.

A.—Wigmore Tropical Fisheries, 74, Wigmore Street, London, W.1.

(South Hackney, E.9, 867.)

PRACTICAL LETTERS from OUR READERS

Axleboxes for Garden Railway Trucks.

DEAR SIR,—With reference to the article on this subject by Mr. Greenly, all authorities are now agreed that oil holes or grooves in the pressure area of a bearing only serve to lead the oil away from the point where it is wanted, so the top brass of an axle-box should have no oil-hole. The same applies to most lathes, where the pressure is upwards, and the top brass has an oil-hole; the oil is visibly pumped out of the hole when the lathe cuts. The proper thing to do is to plug this oil-hole, and drill a fresh one in the bottom brass, with a siphon to lead the oil into the bearing, instead of out. It is surprising what a difference this makes to the running of the lathe under a heavy cut.

Yours truly,

Cambridge. A. W. HARROLD.

Model Locomotive Design, and old Beam Engines.

DEAR SIR,—There has been a good deal of correspondence lately on small locomotive proportions, and the question of superheat, on which I would like to make some comments.

I see Mr. Willoughby quoting Mr. Harrison's remark that it is necessary to "calculate the best bore and stroke for cylinders to be steamed by a given boiler capacity." I should be delighted to know how he proposes to do this, as even in full size work, the heat transfer in a proposed boiler can only be judged from previous experience of somewhat similar boilers.

Mr. Keiller's experience of getting about the same water consumption per B.H.P. hour with different lengths of cut-off is very interesting. Having read Mr. Keiller's letters and seen some of his work, I cannot question his results; these show all the symptoms of a small engine taking saturated steam, cylinder condensation being almost in inverse proportion to the cut-off. They go far to prove the fallacy of the general belief that model locomotives attain a high steam temperature. I have carried out several experiments in superheating, by radiant heat superheaters, and I can safely say that the orthodox small locomotive superheater does no more than render the steam fairly dry. Many seem to believe that a dry exhaust means lack of cylinder condensation. Actually, in the average case, it merely means re-evaporation and a high flue gas temperature. A reasonably high superheat would tear chunks out of the usual gun-metal cylinders and flat valves. Mr. Willoughby states that superheating does not reduce wire-drawing losses; it does, as the viscosity of the steam is reduced. Higher steam velocities are allowed in large steam pipe design, where superheat is employed.

By the way, "L.B.S.C.," is rather pessimistic, rating the efficiency of the loco boiler at 6 per cent. Good ones will, under favourable conditions, touch 80 per cent. 6 per cent. is frequently about the overall efficiency. Also, why does he call his shuttle valve steam pumps "Weirs," and the spring trip type "Worthingtons"? The resemblance is so distant that I can hardly trace it in the former, and completely miss it in the latter.

Re old beam engines. The engine Mr. Cole illustrates is at Carn Bree, I believe. I think he is wrong about the makers, these engines generally being built by Harvey and Co., Sandys Vivien and Co., or the Perran Foundry Company. In this same issue Mr. P. W. Wilson says that if the average amateur aims at good workmanship, the design has little influence on the efficiency. Don't you believe it! The small engines react to design just as much as the large ones.

Yours faithfully,

Harrow. "W.M."

Adhesion.

DEAR SIR,—In reply to Mr. G. L. Wilde, may I say that my letter on the above subject in your issue of August 1st last should have read "——or round the axles between the wheels and the frames, *connected up so that the polarities are as indicated in sketch,*" but evidently the sketch was unsuitable for reproduction, so that this section was left out. I will, therefore, attempt to explain what the sketch should have shown.

In order to obtain the maximum force of attraction between wheels and track, the magnetic flux would have to flow (*a*) from the axle, through a wheel, along the rail longitudinally to the next wheel on the same side of the engine, through this wheel to the axle, and back through the frame to the axle of the first wheel; or, alternatively, (*b*) through a path, from front axle, through wheel to the left-hand rail, through rear wheel to rear axle and to right-hand rear wheel, through the right-hand rail to the right-hand front wheel and back to the front axle.

It will be seen that a magnetising coil on the axles between the frames will fulfil neither of the above conditions, because if the polarities are arranged so that the lines of force should emerge from one axle, and flow along the rail to enter the other axle, the frames will act as a magnetic shunt and only a very small proportion will flow through the rails. On the other hand, if the N. poles are at one side of the engine and the S. poles at the other, there will be the air gap between the rails in the circuit, so that the only way would be to have the coils in between the wheels and the frames.

If the current passes through the coils so as to keep the magnetism flowing through both ends of the axle in the same direction, we should have case (*b*) above, but if the flux flows in opposite directions in each end of the axle, we should have case (*a*).

With regard to the last paragraph of Mr. Wilde's letter, perhaps he is not aware that

the magnetic track brake, consisting of a horseshoe type electro-magnet with very wide pole-faces and cast-iron shoes, which clamps itself to the rail on being energised, is used extensively in electric traction work.

I do not suggest that either of the above methods have any practical value, but I am quite sure that the adhesion would be increased, which was the original point of controversy.

Yours faithfully,

Stoke-on-Trent. L. WINCOTT.

Institutions and Societies.

The Society of Model and Experimental Engineers.

Meetings at Caxton Hall, Westminster, at 7 p.m.

Tuesday, November 19th. Nomination Night and Competition, Track and Model Night. Members are reminded that the entries for the President's Prize will be shown and judged on this evening.

Workshop. A demonstration by Col. Marchment will be given to-morrow (Friday). Colonel Marchment will show the Practical Use of Gauge Blocks.

Full particulars of the Society may be obtained from the Secretary, R. W. Wright, 202, Lavender Hill, Enfield, Middlesex.

The Finchley Model Engineers' Society.

We were particularly pleased to welcome many visitors on the evening of October 16th, when a most interesting and instructive lantern lecture was given by Mr. O. W. Martin, B.Sc. (Eng.), A.M.Inst.C.E., of Messrs. Sulzer Bros. (London), Ltd., on "Diesel Traction." The Society's exhibition is planned to take place from January 15th to 18th inclusive.

Coming fixtures are as follows: November 6th, Track Night; November 13th, Construction Night; November 20th, Lecture by a representative of Messrs. C. C. Wakefield and Co., Ltd., on "Locomotive Lubrication Problems." All the above will take place at the Avenue House, East End Road, Church End, Finchley, N.3.

Further particulars from the Hon. Sec., S. C. PRITCHARD, "Bishopswood," The Bishops Avenue, East Finchley, N.2.

Croydon Society of Model Engineers.

Our next meeting is a "Discussion Night," to be held on November 4th, at 8 p.m. at Clyde Hall, Clyde Road, Addiscombe. November 18th, "Annual General Meeting," all members are asked to attend.

Hon. Sec. and Treas., H. CLEMENTS, "Olivedene," Coulsdon Road, Old Coulsdon.

Edinburgh Society of Model Engineers.

Meetings are held every Tuesday and Friday evening at 7.30, in the Society's rooms at 1a, Ramsay Lane, Castlehill. As announced last week, two competitions are to be held during the present session. On Tuesday, 5th May, a prize offered by the President, Mr. A. M. Skinner, will be awarded for what, in the opinion of the judges, is the best effort at model or tool making submitted, having regard to the age, experience and equipment of the competitor. Models or tools must be complete, all work must be the unaided effort of the competitor (castings, screws, bolts, etc., excepted), and a substantial amount of the work must have been done during the present session. On Tuesday, 19th May, a prize offered by the Society will be awarded for the best complete model of any kind submitted, a substantial amount of the work on which has been done during the present session.

Hon. Secretary, R. HALDANE, 27, Riego Street, Edinburgh, 3.

Glasgow Society of Model Engineers.

Mr. John Latta, the well-known petrol engine experimenter, was elected as President at our last election of Office bearers. Our next meeting takes place on Monday, November 4th, in the Royal Technical College, George Street, at 7.30 p.m.

Subject: "Gadget Night." On these evenings, members show tools, "gadgets," etc., they have made, and explain their making and uses. Members are asked to contribute by showing their work, however small. It always brings out ideas.

As this is the opening of a new session, interested readers are invited to attend our meetings, and information regarding our Society will be gladly sent by the Hon. Sec.

On Wednesday, November 20th, we are visiting the Glasgow Corporation Refuse Power Station. Meet at the Craigton Road entrance, at 7.30 p.m. If any readers wish to be present, will they please inform the Hon. Sec., J. LINDSAY, 45, Copland Quadrant, Glasgow.

Norwich and District Society of Model Engineers.

A very successful Exhibition was held at Norwich on the 3rd, 4th and 5th October.

It is proposed to distribute the awards at a Supper Social to be held on December 5th, 1935, at which all members are invited to bring their wives and friends. Further details will be given later, but it will assist in making arrangements if all wishing for tickets (about 2s. each) will please send their names and addresses to the Hon. Secretary, W. F. W. Way, 73, Gipsy Lane, Norwich, as soon as possible.

The next General Meeting will be held at the Workshop, King Street, Norwich, on Thursday, November 7th next, at 6.30 p.m.

The Manchester Society of Model and Experimental Engineers.

The next meeting of the above Society will be on Friday, November 1st, 1935, at the Manchester Schools of Technology, Sackville Street, Manchester, when Mr. V. G. Hallett will give a talk on Electric Drills.

Hon. Sec. and Treas., W. E. WOOD, 20, Albert Place, Longsight, Manchester.

Southampton and District Model Engineering Society.

The Annual General Meeting of the above Society will take place at the Adyar Hall, Carlton Crescent, Southampton, on Wednesday, November 13th, at 7.30 p.m. Members are earnestly requested to attend, as several items on the agenda vitally affect the future well-being of the club. The business of the evening will be preceded by a demonstration by a member, Mr. H. Lainson, of handling an everyday object. Come and see for yourself.

Hon. Sec., JOHN F. GARDNER, 43, St. Edmunds Road, Southampton.

Lancaster and District Model Railway and Engineering Society.

We now have our own Club-room, situated above Messrs. Kewleys, Brock Street, Lancaster. At our next meeting, to be held on November 4th, a lantern lecture will be given on "British Railway Locomotives." Members will be allowed to bring a friend to this meeting, which starts at 8 p.m.

Secretary, R. S. HARMSON, 99, Chatsworth Road, Morecambe.

Maidstone Model Railway and Engineering Club.

The winter programme, which includes cine-shows and lectures, was arranged at a recent meeting: It was decided to hold an exhibition at the club room, 29, Union Street, on Saturday, November 2nd, commencing at 3 p.m. Admission will be free, and all those interested in model engineering are invited. Those who have models which they would like to have on show are invited to communicate with the secretary, Mr. W. HILLS, The Orchard, Romney Hill, Maidstone.

The Aylesbury Gang.

Next meeting will be held at the First and Last Hotel, Dunstable, on Friday, November 1st, at 7.30 p.m., when a member will give a lecture on correcting misalignment and other inaccuracies or defects in lathes.

All communications to H. D. Bond, Park Square, Luton.

Eastbourne Society of Model Engineers.

The above society will be holding its third annual Exhibition on Saturday, November 2nd, from 2.30 to 10 p.m., at Willowfield Central School, Eastbourne. Most of the models will be working under steam or compressed air, and a film of engineering interest will be shown every hour.

Other fixtures are: November 7th, general meeting, December 5th, Cinematograph display. Hon. Sec., C. F. PARSONS, 16, Manifold Road, Eastbourne.

York and District Model Engineering Society.

The next meeting of the above Society will be held on November 1st at 7.30 p.m., at the Bay Horse Hotel, Monkgate. Hon. Sec., W. SHEARMAN, JNR., 28, Terry Street, York.

The Junior Institution of Engineers.

Friday, November 1st, 1935. At 39, Victoria Street, S.W.1, at 7.30 p.m. Informal Meeting. Lecture, "Metal Spraying," by Major H. J. Williams. Slides and Demonstrations.

Friday, November 8th, 1935. At 39, Victoria Street, S.W.1, at 7.30 p.m. Annual General Meeting.

The Manchester Model Railway Society

Fixtures for November are: Thursday, 14th, at 7.30 p.m., Meeting at Headquarters, when a 16 mm. film will be shown of the Craigard Model Railway, by kind permission of C. W. Meredith, Esq. Tuesday, 26th, at 7.30 p.m., Meeting at Headquarters, at which details will be given concerning the forthcoming annual Exhibition, which is again being held in the Albert Hall, Manchester, on December 19th, 20th and 21st.

The "Loco. Brotherhood"

(ESSEX DIVISION).

The monthly meeting will be held at the Village Hall, Hatfield Peverel, on Saturday, Nov. 2nd, at 4 p.m., and will be followed at 7.30 by a Social Evening, Dance and Exhibition.

Members are particularly asked to attend and bring their work along, also to give their ladies an opportunity to spend a jolly evening with us.

Some important announcements regarding the Society are to be made during the evening.

J. J. CLARKE, Hon. Sec., Hatfield Peverel, Chelmsford.

Notices.

The Editor invites correspondence and original contributions on all small power engineering and electrical subjects. Matter intended for publication should be clearly written on one side of the paper only, and should invariably bear the sender's name and address. Unless remuneration is specially asked for, it will be assumed that the contribution is offered in the general interest. All MSS. should be accompanied by a stamped envelope addressed for return in the event of rejection. Readers desiring to see the Editor personally can only do so by making an appointment in advance.

All subscriptions and correspondence relating to sales of the paper and books to be addressed to Percival Marshall and Co., Ltd., 13-16, Fisher Street, London, W.C.1. Annual Subscription, £1 1s. 8d., post free, to all parts of the world. Half-yearly bound volumes, 11s. 9d., post free.

All correspondence relating to Advertisements and deposits to be addressed to THE ADVERTISEMENT MANAGER, "The Model Engineer," 13-16, Fisher Street, W.C.1.

Contents.

The asterisk (*) denotes that the subject is illustrated.

SALES AND WANTS

EVERYBODY'S MARKET for ENGINEERING SCIENTIFIC ELECTRICAL GOODS

Advertisements are inserted in these columns at the rate of **One Penny** *per word; minimum charge for advertisement,* **One Shilling.** *Single letters or figures are charged as words, and a compound word as two words. The advertiser's name and address are charged for.*

Advertisers who wish to separate *their announcements into distinct paragraphs must have not less than 20 words in any one paragraph followed by the word "Below"—which is charged for.*

"Box" replies, *care of these offices, are charged 6d. extra to cover postages. The following words must appear at end of advertisement: "Box——, 'Model Engineer' Offices," for which usual rate will be charged. (Advertisers need not include our full address.)* **When replying to a "Box No." advt.** *address your envelope: Advertiser, Box——, "The Model Engineer," 13-16, Fisher Street, London, W.C.1.*

All advertisements in these columns must be prepaid, *and remittances should be made by Postal Orders or Stamps, and sent to the Advertisement Manager, "The Model Engineer," 13-16, Fisher Street, London, W.C.1.*

Please state under which Classified Heading you wish your advertisement to appear; the classifications are as follows:—

General, Models, Wireless, Motoring Tools, Engines, Electrical, Business, Wanted.

Advertisers are requested to send in their announcements as early in the week as possible, as although we accept advertisements up till the first post on Friday preceding the date of issue, **we cannot guarantee the insertion of those arriving on this day.** *Telephone: Holb.: 3818-3819.*

OUR DEPOSIT SYSTEM.

We will receive from intending purchasers the purchase money of any article advertised or sold by our advertisers, and will acknowledge its receipt to both the Depositor and the Vendor, whose full names and addresses must be given. Unless otherwise arranged beforehand between the parties, it is understood that all goods are sent on approval, and that each person pays carriage one way if the goods are returned. The deposit is retained by us until we are advised of the completion of the purchase, or of the articles having been returned and accepted. In addition to the amount of the deposit, a fee of 1/- for the sum of £1 and under, and 1/6 for amounts in excess of £1, to cover postage, etc., must be remitted at the same time, and sent to the Advertisement Manager, "The Model Engineer," 13-16, Fisher Street, London, W.C.1. In cases of persons not resident within the United Kingdom, double fees are charged.

The amount of the deposit must be sent either by Postal Order or Registered Letter. **(Cheques cannot be accepted.)**

The fee mentioned above should be sent in stamps or by Postal Order as a separate amount.

In cases of exchange, money to the value of the article should be deposited by each party. **We cannot receive the articles themselves.**

General

Watch Repairers. Send 3d. for list of Tools, Materials, Watches, Clocks, Gramophone Parts. Guaranteed watch repairs. Complete clock movements stocked. Parcels fully insured.—BLAKISTON, Ainsdale, Lancs.

Cheap Printing. 1,000 Billheads, 3s. 6d. Samples free.—CRETEWAY PRESS (22), Buxted, Sussex.

Case-Hardening and Heat Treatment. Send your inquiries to.—KASENIT, LTD., the recognised specialists, Henry Street, Bermondsey, S.E.1.

Small Turned Screws, Nuts and Washers. Assorted gross B.A., brass 2s., steel 2s. 6d. Whitworth, brass, 3s., steel, 2s. 6d. List and samples, 2d. Trade supplied.—J. H. BENNETT, Station Road, Willesden Junction, N.W.10.

M.E. Hexagon Screws, Nuts and Washers, lowest prices, gross lots, large assortment of other sizes.—ALLNUTT & Co., Lee Chapel Lane, Langdon Hills, Essex.

Bargains! Air Compressors, new, 30s.; Super Spray Guns, 18s. 9d.—JOHN M. E. STEEL, Bingley.

For Carnival Novelties, Decorations, Flags, Balloons, Streamers, Hats, etc., go to V. O. GINN AND Co., 16, Red Lion Square, High Holborn, W.C.1 (close to Kingsway). List free. Chancery 7654.

"Machine Shop Companion." Splendid book, 100 illustrations, post free 2s. 3d. (abroad 2s. 6d.).—BENTLEY'S PUBLISHING COMPANY (Dept. M.E.), Halifax, Yorks.

Reduced Prices: Eureka Improved Air Compressors. Castings and Drawings from 9s. per set. Photo 3d.—POYSER, Peck's Hill, Mansfield.

Make Your Own Castings in Brass, Bronze, Aluminium. Drawings and full instructions how to make and run your own plant, 15s.—AIR UNITS, Warrington Road, Ashton-in-Makerfield.

Screws, Nuts, Washers (Special Model Engineers' Sizes). Everything for Electrical Rewinds and Repair. Lists free.—LUMEN ELECTRIC COMPANY, Scarisbrick Avenue, Litherland, Liverpool, 21.

Ball Bearing Plummer Blocks, 1", 5s.; ¾", 4s. 3d.; ½", 2s. 6d. Shafting, Hangers, Pulleys, Cones, Complete Countershafts from 10s.—HALL'S, 30, Colindale, Erith.

"Model Engineer" from 1925 to 1932. Few Nos. missing, but all others in nice condition. Offers. Also "M.E." Handbooks.—Box 900, MODEL ENGINEER Offices.

Unbound Volumes, Locomotive XX to XXXVII. Complete except July, 1918, 44s. "Model Railway News," 1 to VII, 14s. Locomotive VI, bound, 3s.—EVEZARD, 16, Farm Lane, Purley, Surrey.

Tinsmith's Guillotine, in perfect condition complete with New Blades, cost £25, take 70s. Particulars stamp.—Below.

Battery Charger, 230 v., input 10 v., 7 amp. output, with Marble Switchboard Ammeter, Resistances, Switches, Iron Brackets, etc. Cost £10, take £2, near offer. Particulars stamp.—East Garage, Whaploud Road, Lowestoft.

Casting Moulds for Lead Soldiers, Animals, etc. Sample mould, 2s. 9d. Catalogue free.—Industries.—Below.

"Home Toymaking," just published, with 180 illustrations of practical amusing toys, 1s. 2d.—INDUSTRIES, 13, Gordon Avenue, Twickenham.

Steam Car Developments and Steam Aviation. A monthly magazine, price 9d., Modern Steam and its Application. Published by R. H. and H. W. BOLSOVER, Castle Road, Whitby.

For Sale, Contents of Engineer's Shop, Rego Driller, Crypto Dynamo.—179a, Wood Street, Walthamstow.

Complete Set of Castings for Domestic Washing Machine, with Four Motions, 7s. 6d. Particulars, stamp.—VICTORIA WORKS, City Road, Manchester.

Boiler Feed Injector, £1; Crankshaft, 2s. 6d.; Front Cylinder Cover with Gland, 2s. 6d.; 7½" dia. Heavy Flywheel, 2s. 6d.—302, Moorside Road, Flixton, Manchester.

Printing Press with Type, 22s. 6d. Bargain.—Particulars, W. WEBSTER, 291a, Normanton Road, Derby.

Home Cinematography

Electric Home Cinemas, standard films cheap. Lists.—WAYLAND, 109, Kenlor, Tooting, London.

Movies at Home. How to make your own Cinema Projector. Particulars free.—MOVIESCOPE (O), Pear Tree Green, Doddinghurst, Essex.

Models

"Pioneer" Castings and Parts, machined or rough. Stamped envelope for list.—FENN, 2a, Charles Place, Drummond Street, London, N.W.1.

Boilers in Steel or Copper, all types and sizes. Locomotives Boilers from ½" scale made to fit your frames, flanged plates, supplied copper or steel.—GOODHAND, Marlborough Road, Gillingham, Kent.

Bargains! Large stock to clear; some of the goods described are sold 70% below their actual factory cost; mostly foreign goods. Sailing, Clockwork, Electric and Steam Boats from 2s. 6d. to 15s. Also Steam Engines, Boilers, Locos., Trucks, Electric Motors by Stuart's, Marklin's, Bing's also Rails, Sheds, etc. Inspection invited without obligation.—F. C. REISER, 72, Twyford Avenue, W.3. Phone ACOrn 1783.

Exchange Stuart Multitubular Boiler, 16×24, excellent condition, usual fittings for Senior ½ H.P. petrol engine, cash adjustment.—WYNNE JONES, Bellevue, Uxbridge Square, Caernarvon.

Dyak and Maisie. Everything in stock. See my last week's advertisement for prices.—SUMMERSCALES, Soham, Ely, Camb.

Powerful Traction Engine, 1½" scale, Blue Prints, 1s. 7d. each; Single Cylinder and Covers, 10s. 6d.; Compound, 16s. 6d.; Chimney Base, 3s.; Cap, 1s.; Finished Gears, Materials. List 1½d.; Overtype Engine, 1½" scale, Castings. If interested, please enquire.—A. J. EVERY, Engineer, Mill Lane, Shoreham-by-Sea.

Locomotives With a Personality, "Ejaycee" Locos. are built to individual requirements. Let us quote you for your next Loco. All types from "O" to 5" gauge. You buy a loco. but you invest in an "Ejaycee." List 3d.—"EJAYCEE" MODELS, 66a, George Street, Hastings.

Bassett-Lowke, Boiler and Engine Boiler, 10 ins. by 21½ ins. high, multitube complete with fittings; Engine Horizontal Twin, 1 inch by 2 inch stroke; Lubricators in first class condition, the two £5. Particulars stamp. Exchanges anything useful.—East Garage, Whaploud Road, Lowestoft.

Model Engine Supplies and Light Engineers.—Partner wanted, London.—Box 901, MODEL ENGINEER Offices.

Castings and Drawings for L.M.S. "Pacific," "The Princess Royal," and Southern Railway "Schools" class, 4-4-0, 3 cyl. Both 3½" gauge. These make up into close copies of originals. Also castings for 2½" and Gauge 1. Stamp.—H. P. JACKSON, 90, Holgate Road, York.

Locomotive Wheel Castings at low prices. See advert. Oct. 17th.—CLARABUT, 6, Park Road, Wembley.

Exceptional Offer, Petrol, Paraffin, Crude Oil Engines, 1 to 12 h.p. Petter, Crossby, Lister, Gardner makes; also 3 h.p. Petter 50 volt Electric Set, £14 10s. od. Several 110 volt Dynamos.—WOODMAN, South Muskham, Newark.

Inch Scale Traction Engines Castings, Cylinder, 8s. 6d. set; Front Rims Malleable, 1s. 6d. each; Bosses, 6d. each; Swivel, 2s. 3d.; Motion Plate, 2s.; Axle Boxes, 1s. 6d. pair; Pump and Check Valve. Stamp for list.—Below.

7¼" Gauge Midge Castings, complete set as advertised last week, 50s. Machining work of all kinds undertaken.—GOODMAN, 76, Spencer Road, Wealdstone, Middx.

15 cc. Don't Forget the Address or Prices (Postage Paid). Set Engine Castings, 15s.; Set Carb. Castings, 4s.; 30 cc. Carb., same price; also that special offer—Order Engine and Carb. Sets together, 17s. 6d.; Full Blue Prints included. Photo of finished job, 6d. We should like to hear from you. Write off now to—6, Grasmere Gardens, Ilford, Essex.

1" Scale Coal-fired Pacific (No Tender), £10; Bassett-Lowke, 4-6-0, 8-wheel Tender, £12; North Eastern, 4-4-0, £8; Unfinished 2-6-2 Tank, £5. All high pressure. Track with points, cheap. —Below.

¾" Scale Atlantic, by Stuart Turner, Coal-fired, as new, £50; G.W.R. "Gooch" 4-4-0 (unfinished), £10; Atlantic Chassis complete £8. Wanted good 1" Scale Loco.—H.K., Willoughby House, Mablethorpe, Lincs.

8 Footer Single Loco. Model, built and described by Mr. Brown last week "M.E.," built from Marlin's Model Casting. See list.—60a, Boleyn Road, London, E.6.

"Express Loco." Supplies Co., "Live Steam" Engines, Castings, Parts and Materials, G. 1, 2½" and 3½" gauge. Brazing materials, Easy Running Strip, Cuprotectic Copper Tube, from 3/32—3½" dia., all thicknesses.—52, Blanmerle Road, New Eltham.

Coal-fired 2½" Atlantic passenger puller, absolutely complete and working, £8; 25 cc. Water-cooled Grayson, £1. Wanted Outboard Motor, Lathe. Evenings.—REEVES, 142, Sherringham Avenue, Tottenham, N.17.

Loco. for Collector of Rare Specimens, about 3 feet long, 6½" gauge, with glass show case, £75.—Box 898, MODEL ENGINEER Offices.

Fine ¾" Scale "Pacific," Coal-fired, Link Motion, Bogie Tender, Engineer Built. High-class Workmanship. Cheap.—45, Elms Lane, Sudbury, Wembley.

The Mathematics of Wireless, by Ralph Stranger. This book is essential for the wireless amateur who desires to gain a fuller knowledge of his subject. Written by one who has the gift of explaining abstruse subjects in a simple fashion, it will enable its readers to attempt research and experiments which at one time were far beyond their powers, 256 pages, fully illustrated. Price 5s., post free 5s. 6d.—PERCIVAL MARSHALL & Co., LTD. 13-16, Fisher Street, London, W.C.1.

Television and Short Wave Handbooks, by F. J. Camm. An up-to-the-minute and lavishly illustrated book written in easily understood language, dealing with every branch of television. Instructions are given for making simple vision machines and short-wave receivers and adaptors. A useful dictionary of television terms is included, 3s. 6d.; postage 6d.—PERCIVAL MARSHALL & Co., LTD., 13/16, Fisher Street, London, W.C.1.

Buck and Ryan's Lathe Department. Drummonds, Milnes, Myford, Exe, Union, Portass, Edgar, Bantam, Boley-Lienen, I.XL. 5" Leader, Master, and many other well-known makers. Send your enquiries to our special Lathe Department M.—310-312, Euston Road, London.

Wade Lathe Screwcutting Attachment, 15s., post 1s. 3d. extra.—AIRD, Gardner Street, Brighton.

Have You Placed Your Order for a "Myford" 3" Lathe? All the leading Tool Merchants stock this machine. Illustrated lists and address of nearest agents from: THE MYFORD ENGINEERING Co., Neville Works, Beeston, Notts.

Burnerd Chucks, British Made, for accuracy and lasting service. Small independent 4-jaw with steel bodies, and reversible jaws, minimum weight and overhang, ideal for model, instrument, and precision work, 3½", 20s., 4", 21s.; 4½", 25s.—Below.

6 in. Independent Model with semi-steel body, suits Drummond 3½" and 4", and larger lathes, 50s.—Below.

3 in. 3-Jaw Lever Scroll Model with 2 sets jaws, 27s. 6d. Small overhang, light weight. Descriptive lists, with backplate prices, on request. All postages extra. Obtainable from all tool dealers; or from: F. BURNERD & Co., Dryburgh Works, Dryburgh Road, London, S.W.15.

Lathes, Power and Treadle, by all the leading makers, in stock. Send your inquiries.—Ross & ALEXANDER (LONDON), LTD., 165, Bishopsgate, E.C.2.

Milling Attachments, Dividing Heads, Circular Table.—WHEELER Co., LTD., Trench, Wellington, Shropshire.

Powerful Handshaper, £8; Greenherd Mandrel Press, 25s.; Pedestal Tool Grinder, £4; Circular Saw, £2; Hand Guillotine, 12s.—TIMMS, Power Road, Chiswick, W.4.

3½" Drummond Treadle Lathe Vee Belt, £8; 2⅛" Portass Lathe, 3 Speed Treadle, £4; Portass Bench Shaper.—WALSH, 149, Newbrook Road, Over Holton, Bolton.

Reduced Prices: Eureka H.S.S. Ball Bearing Drilling Machine, Filing Machines, Rotary Tables, etc. Drilling Machine Drawings and Castings from 10s. 6d. per set. Photos 3d. each.—POYSER, Peck's Hill, Mansfield.

Astounding Offer: Twenty-four 18 in. Lengths Assorted B.A. Hexagon Free-cutting Bright M.S., 2s. 6d. post free.—GREGORY & SUTCLIFFE, Huddersfield.

Free "Brooksway" Engineer's Chart with each order. 2s. 6d. any six, either Milling Cutters, and End Mills, Circular Saws, Reamers, Taper Shank Drills, or Dies, or 12 Files, Grinding Wheels, or Taps.—BROOKS, Milton Street, Sheffield.

Tools by Easy Payments. Lathes, 25s.; Compound Rests, 15s.; Foot Treadles, 35s.; Saw Benches, Power, £3; Treadle, £6 10s.; Constructor's Saw Fitments, 12s. 6d. Lists, 2d.—BROWN BROS., Accrington.

Bench Legs, Strong, Slotted Angle Iron Framework easily fixed and adaptable for Shelving underneath, from 16s. pair. Particulars, stamp.—GREGORY AND SUTCLIFFE, Huddersfield.

5" Back Geared Treadle Lathe, Compound Slide Rest, Chucks, Tools, £3 10s. od.—154, Staines Road, Ilford, Essex.

Compound Slide Rest for hand rest, slightly shop soiled, £1.—KINGSTON, Rock-a-Nore Rd., Hastings.

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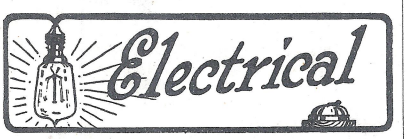

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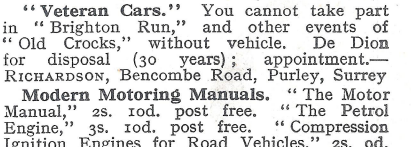

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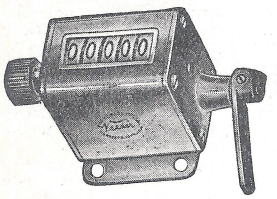

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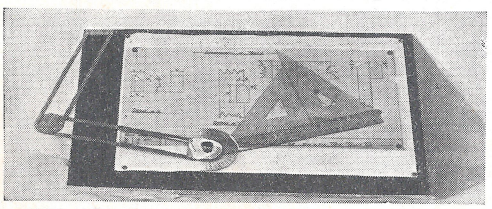

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October 31st—S.M.A.E. Closing date for Farrow Shield Contest attempts.

October 31st—Society of Model and Experimental Engineers. Lecture by Mr. L. M. G. Ferreira, M.Inst.C.E., on "Injectors and Ejectors."

November 1st—Society of Model and Experimental Engineers. Demonstration by Col. Marchment, showing the practical use of Gauge Blocks.

November 1st-2nd—The Dublin Society of Model and Experimental Engineers. Exhibition to be held in the Engineers' Hall, 35, Dawson Street, Dublin, from 2.30 p.m. to 11 p.m.

November 4th—Glasgow Society of Model Engineers. "Gadget Night" at the Royal Technical College, George Street, at 7.30 p.m.

November 4th—Lancaster and District Model Railway and Engineering Society. Lantern Lecture on "British Railway Locomotives," at 8 p.m., in the Clubroom.

November 13th—Southampton and District Model Engineering Society. Annual General Meeting at the Adyar Hall, Carlton Crescent, 7.30 p.m.

November 14th—Manchester Model Railway Society. Cinema film, "The Craigard Model Railway," 7.30 p.m.

November 18th—Croydon Society of Model Engineers. Annual General Meeting.

November 19th—Edinburgh Society of Model Engineers. Cinema film exhibited by Mr. A. W. G. Wylie, 7.30 p.m.

November 19th—Society of Model and Experimental Engineers. Nomination Night and Competition, Track and Model Night.

November 20th—Finchley Model Engineers' Society. Lecture by a representative of Messrs. C. C. Wakefield and Co., Ltd., on "Locomotive Lubrication Problems."

November 20th—Glasgow Society of Model Engineers. Visit to Glasgow Corporation Refuse Power Station, 7.30 p.m.

December 4th—P.M.A.L. Annual Dinner and Prizegiving at The Bedford Hotel, Balham.

December 5th—Norwich and District Society of Model Engineers. Supper Social and Prize Distribution.

December 12th—Society of Model and Experimental Engineers. Annual General Meeting.

December 13th—Junior Institution of Engineers. Inaugural Meeting of 1935-36 Session, at the Royal Society of Arts.

December 17th—Edinburgh Society of Model Engineers. Lecture by Mr. M. J. H. Cowie, describing the building of his working model picket boat, illustrated by lantern slide, 7.30 p.m.

December 20th and 21st—Manchester Model Railway Society. Annual Exhibition at Albert Hall, Manchester.

January 15th-18th, 1936—Finchley Model Engineers' Society. Exhibition at the Avenue House, East End Road, Church End, Finchley, N.3.

January 29th, 1936—P.M.A.L. Annual Dance and Exhibition of Models at The Farnan Hall, Streatham, 7. p.m. to 12.

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